REPORTS OF FINNISH ENVIRONMENT INSTITUTE 19| 2013

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Finnish Environment Institute

SUOMEN YMPÄRISTÖKESKUKSEN RAPORTTEJA
19 | 2013

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Suomen ympäristökeskus

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Finnish Environment Institute SYKE

The proficiency test provider:

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ALKUSANAT

Suomen ympäristökeskus (SYKE) on toiminut ympäristöalan kansallisena vertailulaboratoriona vuodesta 2001 lähtien. Toiminta perustuu ympäristöministeriön määräykseen, mikä on annettu ympäristönsuojelulain (86/2000) nojalla. Vertailulaboratorion tarjoamista palveluista yksi tärkeimmistä on pätevyyskokeiden ja muiden vertailumittausten järjestäminen. SYKEn laboratoriot on FINAS-akkreditointipalvelun akkreditoima testauslaboratorio T003 ja kalibrointilaboratorio K054 (SFS-EN ISO/IEC 17025) sekä vertailumittausten järjestäjä Proftest SYKE PT01 (SFS-EN ISO/IEC 17043, www.finas.fi). Tämä pätevyyskoe ei kuitenkaan ole akkreditoinnin piirissä.

Pätevyyskokeen onnistumisen edellytys on järjestäjän ja osallistujien välinen luottamuksellinen yhteistyö. Haluamme lämpimästi kiittää kaikkia osallistujia yhteistyöstä!

PREFACE

Finnish Environment Institute (SYKE) is appointed National Reference Laboratory for the environmental sector by the Ministry of the Environment according to section 24 of the Environment Protection Act (86/2000) since 2001. The duties of the reference laboratory service include providing proficiency tests and other interlaboratory comparisons for analytical laboratories and other producers of environmental information. SYKE laboratories has been accredited by the Finnish Accreditation service as the testing laboratory T003 and the calibration laboratory K054 (EN ISO/IEC 17025) and as the proficiency testing provider Proftest SYKE PT01 (EN ISO/IEC 17043, www.finas.fi). This proficiency test is not included in the accreditation scope.

The success of all proficiency tests require confidential co-operation between the provider and participants. We thank you for your co-operation!

Helsingissä 24 toukokuuta 2013 / Helsinki 24 of May 2013

Marja Luotola

Laboratorionjohtaja / Chief of Laboratory

1 INTRODUCTION

Proftest SYKE carried out this proficiency test for leaching testing of fly ash samples using one stage- and two stage batch leaching tests. These tests are used as compliance tests in evaluating wastes material for landfill disposal. The samples to be tested were distributed to the participants in November 2012 for determination of leached amounts inorganic substances (As, Ba, Cd, Cr, Cu, Mo, Ni, Pb, Sb, Se, Zn, Cl^-, SO_4^{2-}, and F^-), dissolved organic carbon (DOC), pH and conductivity in eluates of the samples. The proficiency test was carried out in accordance with the international guidelines ISO/IEC 17043 [1], ISO 13528 [2] and IUPAC Technical report [3].

2 ORGANIZING THE PROFICIENCY TEST

2.1 Responsibilities

Organizing laboratory:
Proftest SYKE, Finnish Environment Institute (SYKE), Laboratory Centre
Hakuninmaantie 6, 00430 Helsinki
tel. +358 20 610 123, fax +358 9 448 320

The responsibilities in organizing the proficiency test were as follows:

- Kaija Korhonen-Ylönen, coordinator
- Katarina Björklöf, coordinator trainee
- Keijo Tervonen, technical assistance
- Sari Lanteri, technical assistance
- Markku Ilmakunnas, technical assistance and layout of the report
- Ritva Väisänen, technical assistance.

Co-operation partner for analytical expertize and sample preparation: Water Protection Association of the River Kokemäenjoki (KVVY), Tampere Finland. The co-operation partner was responsible for acquiring the sample material, for producing and testing the batches of samples, for the leaching tests as well as chemical and physical analytics related to the leaching tests. All these procedures are included in the accreditation of the co-operation partner (T064, EN ISO/IEC 17025, www.finas.fi).

The responsibilities of the analytical experts were as follows:

- Marika Kaasalainen, batch leaching tests
- Raija Ivalo, sample preparation, batch leaching tests, analysis: anions (IC), DOC, pH and conductivity
- Sirpa Väntsi, metals (ICP-MS and ICP-OES)

2.2 Participants

In this proficiency test (PT) in total 19 laboratories participated, from which 12 were from Finland and 7 from other countries (Appendix 1). The sample testing laboratory and analytical expert has code number 10 in the result tables. In total, 9 of the participants (participants 1, 2, 10, 12, 13, 15, 16, 18 and 19) were accredited.

2.3 Samples and schedule

Sample material was fly ash from recycled fuel and wood. The sample material was air dried, sieved and homogenized prior to distribution to subsamples. Particle size of the sample was < 4 mm and the moisture content 0.3 %. Each participant received 500 g of test material. The total organic carbon (TOC) content of the sample was less than 5 g/kg dry weight. The following analyses were tested:

- metals (As, Ba, Cd, Cr, Cu, Mo, Ni, Pb, Sb, Se, Zn)
- Cl^-, SO_4^{2-}, F^-, DOC, pH and conductivity

The samples were delivered on 13 November 2012. The samples were requested to be kept at room temperature in a dry place and protected from light. One stage batch leaching test was requested to be started on 19 November 2012 and the filtration of the one stage eluate to be done on 20 November 2012. This filtrate was requested to be split in two subsamples of which the participants sent one subsample to KVVY for the metal analysis. This sample was requested to be at KVVY not later than 22 November 2012. The participant was requested to analyse the other subsample according the procedure of the laboratory (metals and the other analytes). The results were requested to be reported to Proftest SYKE not later than 7 January 2013.

Used sample codes on the result sheet were as follows:

R1	one stage batch leaching test, L/S 10
2R1	one stage batch leaching test, L/S 10, the results were calculated at SYKE using the results measured by KVVY
R21	two stage batch leaching test, L/S 2
R22	two stage batch leaching test, L/S 10

2.4 Feasibility, particle size and homogeneity studies

The feasibility of the ash sample for one and two stage batch leaching tests were studied by comparing the results from inorganic substances Cl^-, SO_4^{2-}, conductivity and DOC using the R1/R2 ratio. This ratio was mainly close to one except for F^- and therefore the results from both tests are mainly corresponding to each other in this specific sample matrix (Appendix 2). The particle size of the sample was 0.006-0.063 mm measured by Sedigraph (Appendix 3).

Homogeneity testing was performed using six subsamples with duplicate analytical determinations per sample (Appendix 3). According to the homogeneity tests results, the sample was considered homogeneous.

The pretesting of the ash sample show that the test sample was not applicable for percolation test and therefore one- and two- stage batch leaching tests were used in this proficiency.

2.5 Feedback from the proficiency test

The participants did not comment on the arrangements or the evaluation procedures. Other feedback is described below:

Lab	Comment to the samples / PT	Action/Proftest
5	The laboratory asked more detailed information about how the samples were treated at KVVY.	We delivered more information about the treatment process at KVVY. This information is included in this report (Chapter 2.6). In future tests this information will be provided with the preliminary results.
7	Hydrofluoric acid (HF) was used as preservative for sample 2R1, which was sent to KVVY for metal analysis. The method used by KVVY did not support sample preserved in HF.	Results for sample 2R1 were not calculated for laboratory 7. In future proficiency tests, the preservation process will be described in more detail in the sample letter.
16	The Pb results for sample R21 and R22 were switched.	These results were treated as outliers. The z-values would have been satisfactory (R21: z =1.166 and R22: z = 1.955) if the results would have been reported right).

2.6 Treatment of sample 2R1 at KVVY

The samples sent by each participant were treated according to routine procedures in the KVVY laboratory by adding 5 ml of 67-69 % HNO_3 to 20 ml of sample. This way all samples contained the same acid concentration as the standards and controls used in the final analyses. The dilution of the samples were taken into account when calculating the results.

Table 1. The methods used for analysis of metals in sample 2R1 at KVVY.

Analyte	Method	Detection limit	Measurement uncertainty (k=2)	Reference
As	ICP-MS	0.2 µg/l	25 %	EN ISO 17294-1; 2006 EN ISO 17494-2; 2005
Ba	ICP-OES	20 µg/l	20 %	EN ISO 11885; 2009
Cd	ICP-MS	0.1 µg/l	20 %	EN ISO 17294-1; 2006 EN ISO 17494-2; 2005
Cr	ICP-OES	20 µg/l	25 %	EN ISO 11885; 2009
Cu	ICP-MS	5 µg/l	20 %	EN ISO 17294-1; 2006 EN ISO 17494-2; 2005
Mo	ICP-OES	10 µg/l	25 %	EN ISO 11885; 2009
Ni	ICP-MS	0.5 µg/l	30 %	EN ISO 17294-1; 2006 EN ISO 17494-2; 2005
Pb	ICP-OES	10 µg/l	25 %	EN ISO 11885; 2009
Sb	ICP-MS	0.5 µg/l	35 %	EN ISO 17294-1; 2006 EN ISO 17494-2; 2005
Se	ICP-MS	1 µg/l	30 %	EN ISO 17294-1; 2006 EN ISO 17494-2; 2005
V	ICP-MS	0.1 µg/l	30 %	EN ISO 17294-1; 2006 EN ISO 17494-2; 2005
Zn	ICP-OES	20 µg/l	25 %	EN ISO 11885; 2009

2.7 Processing of the data

2.7.1 Pretesting of the data

Before the statistical treatment, the data was tested according to the Kolmogorov-Smirnov normality test and the outliers were rejected according to the Hampel test for calculation of the mean value (H in the results sheets).

2.7.2 Assigned values and their uncertainties

The robust mean of the participant's results were used as the assigned values in this proficiency test (Appendix 5). The robust mean is not a metrological traceable value. As it was not possible to have a metrological traceable assigned value, the consensus mean was the best available value to use for the assigned values. The reliability of the assigned value was statistically tested according to the IUPAC Technical report [3]. In calculation of the robust mean outliers are not normally rejected, but they are iterated before the final calculation of the robust mean. Before the robust calculation of the assigned value, some outliers were rejected in case that the results deviated from the robust mean more than 50 % or in case that the result was reported erroneously.

The reliability of the assigned value was statistically tested according to the IUPAC Technical report [3]. Also the means (after using the Hampel outlier test) and the medians of the data were calculated, which correlated well with the assigned values (Table 2). The uncertainties of the assigned value varied between 0.6-24 percent (Appendix 5). The assigned values for Ba (R21), Cr (R21), F (R1, R21), Mo (R21), Pb (R21, R22), Zn (R21, R22) contain high uncertainties according to IUPAC's criteria; $u/s_p \leq 0.3$ (Appendix 5). Only the assigned values for Cl^-, conductivity, pH, Se and SO_4^{2-} can be considered reliable according to this criterion.

2.7.3 Standard deviation for proficiency assessment and z score

The target values for the total standard deviations for proficiency testing (Table 2, 2*targetSD) were estimated directly from the total SD_{rob} % of the results. For some analytes, present in small concentrations (As, Cd, Cu, DOC, Ni, Sb, V), target values for total standard deviations were not set due to high standard deviations (SD_{rob} %) in the results of the participants. The used target values for the total standard deviations were typically smaller than in the previous leaching proficiency test [6] due to lower deviations between the reported results in this test. The reliability of the target value for the total deviation and the reliability of the corresponding z score were estimated by comparing the deviation for proficiency assessment (s_p) with the robust standard deviation of the reported results (SD_{rob}). The criterion $SD_{rob} < 1.2 * s_p$ was fulfilled fairly and the evaluation of performance is reliable for this proficiency test.

The performance evaluation of each participant was carried out by using z scores (Appendices 7 and 9).

Some target values for the standard deviations for the proficiency assessment have been raised after the reporting of the preliminary results in January 2013 (Table 2), to make the evaluations of performance more reliable. In one case the target value for the standard deviation was cut (Ba sample R22) because R22 should be easier to analyse than R21 due to the fact that the eluate in sample R22 contain less interfering substances because of a bigger dilution rate (L/S10) compare to sample R21 (L/S2). Therefore it is expected that samples R22 would be easier to analyse and random deviations smaller.

Table 2. Summary of the changes made in the evaluation criteria after sending of the preliminary results and their effect on the performance of laboratories.

Analyte	Sample	Assigned value (2*Targ SD%) in preliminary results	Assigned value (2*Targ SD%) in final report	Positive change compared to preliminary result	Negative change compared to preliminary result
Ba	2R1	2.09 (10)	2.09 (15)	Labs 8, 19	
	R1	2.44 (10)	2.44 (20)	Labs 2, 7, 8, 19	
	R21	0.68 (30)	0.68 (40)	Labs 6, 13, 14	
	R22	2.56 (30)	2.56 (20)		Labs 7, 13, 14
Cr	R1	6.93 (20)	6.93 (30)	Labs 1, 4	
	R21	4.05 (35)	4.05 (40)	Lab 16	
F^-	R22	13.8 (30)	13.8 (40)	Labs 5, 18	
Mo	R1	6.42 (15)	6.42 (30)	Labs 2, 4, 7, 13, 14, 19	
	R21	5.36 (30)	5.36 (35)	Labs 4, 15	
	R22	6.42 (25)	6.42 (30)	Labs 7, 14, 15	
Pb	2R1	6.54 (10)	6.54 (15)	Labs 13	
	R1	6.52 (20)	6.52 (50)	Labs 7, 8, 12, 13	
Se	R1	0.64 (15)	0.64 (25)	Labs 2, 6, 13, 18	
SO_4^{2-}	R1	24800 (15)	24800 (20)		
	R21	20900 (20)	20900 (25)	Labs 4, 6, 16	
Zn	2R1	10.6 (15)	10.6 (20)	Lab 4	
	R1	9.6 (20)	9.6 (30)	Labs 2, 4, 8, 19	
	R21	2.85 (30)	2.85 (40)	Labs 14, 15, 16	
	R22	9.35 (25)	9.35 (30)	Labs 2, 4, 9,	

3 RESULTS AND CONCLUSIONS

3.1 Summary of the results

The summary of the results is presented in Table 3. Explanations to terms used in the result tables are presented in Appendix 6. The results and the performance of each laboratory are presented in Appendix 7. The results and their reported uncertainties grouped according to the analytical methods are presented graphically in Appendix 8 and a summary of z-scores in Appendix 9. The most critical harmful components in this sample were the following analytes: Cl^-, Cr, Mo, Pb, Se, SO_4^{2-} and Zn (Table 4).

Table 3. Summary of the results in the proficiency test 10/2012.

Analyte	Sample	Unit	Ass. val.	Mean	Mean rob.	Md	SD rob	SD rob, %	Num. of labs	2*Targ SD%	Accepted z-val%
As	2R1	mg/kg		0.010	0.008	0.008	0.004	50	16		
	R1	mg/kg		0.018	0.018	0.008	0.022	124,4	17		
	R21	mg/kg		0.011	0.011	0.004	0.016	146,7	17		
	R22	mg/kg		0.048	0.035	0.010	0.046	132,5	17		
Ba	2R1	mg/kg	2,09	2.07	2.09	2.06	0.14	6,7	16	15	94
	R1	mg/kg	2,44	2.44	2.44	2.40	0.27	11	17	20	88
	R21	mg/kg	0,68	0.67	0.68	0.71	0.18	27,3	17	40	82
	R22	mg/kg	2,56	2.53	2.56	2.51	0.28	11,1	17	20	82
Cd	2R1	mg/kg	0,016	0.016	0.016	0.016	0.000	0	16		
	R1	mg/kg		0.006	0.007	0.004	0.004	63,8	17		
	R21	mg/kg		0.008	0.005	0.005	0.003	58,2	17		
	R22	mg/kg		0.010	0.007	0.007	0.004	53	17		
Cl	R1	mg/kg	14300	14283.18	14321.09	14335.00	381.62	2,7	16	10	88
	R21	mg/kg	14100	14131.01	14138.24	13999.50	934.61	6,6	16	20	88
	R22	mg/kg	14500	14359.66	14491.30	14300.00	967.05	6,7	16	20	88
conductivity	R1	mS/m	2100	2095.44	2096.86	2090.00	87.23	4,2	17	10	94
	R21	mS/m	5740	5737.54	5741.74	5670.00	358.12	6,2	16	20	81
	R22	mS/m	1450	1432.73	1451.32	1433.00	143.64	9,9	17	20	82
Cr	2R1	mg/kg	6,71	6.60	6.71	6.79	0.56	8,4	16	20	88
	R1	mg/kg	6,93	6.85	6.93	6.97	1.04	15,1	17	30	94
	R21	mg/kg	4,05	4.06	4.05	4.30	1.18	29	17	40	82
	R22	mg/kg	5,49	5.50	5.49	5.18	0.96	17,5	17	30	94
Cu	R1	mg/kg		0.066	0.039	0.036	0.028	71,1	17		
	R21	mg/kg		0.041	0.019	0.014	0.015	79,9	17		
	R22	mg/kg		0.073	0.056	0.030	0.050	90,6	17		
DOC	R1	mg/kg		47.19	40.06	45.95	18.48	46,1	13		
	R21	mg/kg		19.06	12.19	8.78	12.13	99,5	13		
	R22	mg/kg		54.98	31.85	31.77	25.78	80,9	13		
F	R1	mg/kg	14,9	14.88	14.91	16.20	2.67	17,9	17	25	80
	R21	mg/kg	4,31	4.32	4.31	4.35	1.28	29,7	16	40	71
	R22	mg/kg	13,8	13.78	13.77	14.30	2.18	15,8	17	40	80
Mo	2R1	mg/kg	5,74	5.73	5.74	5.75	0.13	2,3	16	10	100
	R1	mg/kg	6,42	6.39	6.42	6.60	0.96	15	17	30	94
	R21	mg/kg	5,36	5.27	5.36	5.51	1.30	24,2	17	35	82
	R22	mg/kg	6,42	6.38	6.52	6.53	1.10	16,9	17	30	94
Ni	2R1	mg/kg		0.017	0.015	0.016	0.006	42,1	16		
	R1	mg/kg		0.037	0.011	0.010	0.013	122,6	17		
	R21	mg/kg		0.009	0.003	0.002	0.004	133,5	17		
	R22	mg/kg		0.050	0.069	0.012	0.089	127,9	17		
Pb	2R1	mg/kg	6,54	6.60	6.54	6.54	0.33	5,1	16	15	88
	R1	mg/kg	6,52	6.55	6.52	6.60	1.26	19,3	17	50	88
	R21	mg/kg	1,93	1.63	1.93	2.08	0.66	34,3	17	40	71
	R22	mg/kg	5,53	5.21	5.53	5.47	1.17	21,2	17	30	71
pH	R1		12,7	12.70	12.68	12.70	0.13	1	18	3,1	94
	R21		12,9	12.86	12.88	12.89	0.15	1,2	18	3,1	89
	R22		12,7	12.65	12.68	12.68	0.14	1,1	18	3,1	89
Sb	R1	mg/kg		0.033	0.033	0.006	0.065	198,7	17		
	R21	mg/kg		0.002	0.003	0.000	0.004	119,3	17		
	R22	mg/kg		0.029	0.036	0.000	0.073	203,5	17		
Se	2R1	mg/kg	0,75	0.75	0.75	0.76	0.025	3,3	16	10	88
	R1	mg/kg	0,64	0.64	0.64	0.66	0.085	13,2	17	25	94
	R21	mg/kg	0,63	0.60	0.63	0.64	0.14	22	17	40	82
	R22	mg/kg	0,69	0.70	0.69	0.69	0.14	19,7	17	40	94
SO4	R1	mg/kg	24800	24788.88	24772.36	24650.00	2211.30	8,9	16	20	88
	R21	mg/kg	20900	20526.59	20919.76	20637.50	2686.10	12,8	16	25	88
	R22	mg/kg	27600	27935.11	27621.41	27445.50	2083.94	7,5	16	20	88
V	2R1	mg/kg		0.007	0.006	0.006	0.002	25,3	15		
	R1	mg/kg		0.003	0.003	0.004	0.001	39,2	16		
	R21	mg/kg		0.002	0.002	0.002	0.001	31,8	16		
	R22	mg/kg		0.005	0.006	0.005	0.003	50,4	16		
Zn	2R1	mg/kg	10,6	10.67	10.58	10.48	0.90	8,5	16	20	94
	R1	mg/kg	9,6	9.54	9.60	10.00	1.58	16,4	17	30	94
	R21	mg/kg	2,85	2.52	2.85	2.92	0.62	21,9	17	40	82
	R22	mg/kg	9,35	9.51	9.35	9.90	1.98	21,2	17	30	82

Ass. Val.- the assigned value, Mean- the mean value, Mean rob- robust mean, Md - the median value, SD %-the standard deviation as percent, SD rob - the robust standard deviation, SD rob % - the robust standard deviation as percents, Num of Labs - the number of participants, 2*Targ. SD% - the total standard deviation for proficiency assessment at 95 % confidence level ($2*s_p$), Accepted z-val% - the satisfactory z scores: the results (%), where $|z| \leq 2$.

Table 4. Results of the proficiency test and the limit values for analytes in ash (mg/kg dry weight) based on Finnish legislation Government Decree 591/2006 concerning the recovery of certain wastes in earth construction and Government Degree 202/2006 on the landfill of wastes.

		Criteria for landfills Government degree 202/2006			Criteria for recovery of ash Government degree 403/2009			Proficiency test; results (two-stage test)		
Analyte	Unit**	Inert waste L/S 10	Non-hazardous waste, L/S 10	Hazardous waste L/S 10	Total content	Covered structure L/S 10	Paved structure L/S 10	Total content	L/S 2*	L/S10*
As	mg/kg dw	0,5	2	25	50	0,5	1,5		(0.011)	(0.035)
Ba	mg/kg dw	20	100	300	3 000	20	60	2260	0.68	2.56
Cd	mg/kg dw	0,04	1	5	15	0,04	0,04	18	(0.005)	(0.007)
Cl^-	**mg/kg dw**	**800**	**15 000**	**25 000**		**800**	**2 400**		**14 140**	**14 490**
Conductivity	mS/m	-	-	-					5 740	1 450
Cr	**mg/kg dw***	**0,5**	**10**	**70**	**400**	**0,5**	**3,0**	**111**	**4.05**	**5.49**
Cu	mg/kg dw	2	50	100	400	2,0	6,0		(0.019)	(0.056)
DOC	mg/kg dw	500	800	1 000		500	500		(12.19)	(31.85)
F^-	mg/kg dw	10	150	500		10	50		4.31	13.77
Hg	mg/kg dw	0,01	0,2	2		0,01	0,01			
Mo	**mg/kg dw**	**0,5**	**10**	**30**	**50**	**0,5**	**6,0**		**5.36**	**6.52**
Ni	mg/kg dw	0,4	10	40		0,4	1,2		(0.003)	(0.069)
Pb	**mg/kg dw**	**0,5**	**10**	**50**	**300**	**0,5**	**1,5**	**260**	**1.93**	**5.53**
pH			≥ 6						12.88	12.68
Sb	mg/kg dw	0,06	0,7	5		0,06	0,18		(0.003)	(0.036)
Se	**mg/kg dw**	**0,1**	**0,5**	**7**		**0,1**	**0,5**		**0.63**	**0.69**
SO_4^{2-}	**mg/kg dw**	**1 000**	**20 000**	**50 000**		**1 000**	**10 000**		**20 920**	**27 620**
V	mg/kg dw	-	-	-	400	2,0	3,0		(0.002)	(0.006)
Zn	**mg/kg dw**	**4**	**50**	**200**	**2 000**	**4**	**12**	**3360**	**2.85**	**9.35**

*= indicative results are in brackets
**= dw = dry weight.

3.2 Observations on the analytical methods

The standard methods EN 12457-2 (one stage batch leaching test) [4] and EN 12457-3 (two stage batch leaching test) [5] were used to determinate the leaching properties of studied analytes from the sample. The one stage leaching test provides information on leaching components at liquid to solid ratio of 10 l/kg dry matter. During two-stage leaching test, the liquid to solid phase ratio is 2 l/kg dry matter in the first step and subsequently 8 l/kg dry weight in the second step. The cumulative release, L/S10, is calculated from L/S2 and L/S8 results. The concentrations of the analytes are expressed as the leached amounts (mg/kg dry weight) relative to the total mass of the sample.

There were some differences in procedures used by the participants in the leaching tests (Appendix 4).

- Shaking or mixing equipment varied
  - mainly rotary shaker or end-over-end table was used.
- The amount of recovered eluates varied
  - one stage test (VE): 0.4- 0.9 l
  - two stage test: first step (VE1): 0.1-0.3 l; second step (VE2): 0.3-1.7 l

- Time between agitation and separation varied
    - one stage test (T1): 0-1470 min
    - two stage test (T1): 0-25 min
- Different filtration time
    - one stage test (T2): 3-40 min
    - two stage test (T2): 2-390 min

The measurements of metals were mainly done by ICP-MS or ICP-OES -instruments. DOC was measured using TOC analyzers with IR detection (Appendix 4). The reported results with their uncertainties grouped according to the measurement method are shown in Appendix 8. The statistical method comparison was carried out between the different method groups, if the number of the results was at least three. Statistically significant differences were observed as follows:

Sample /Analyte	**Method**	**Mean ± standard deviation, mg/kg dry matter**
R21 / Se	ICP-MS ICP-OES	0.68 ± 0.09 0.44 ± 0.11
R22 / Se	ICP-MS ICP-OES	0.71 ± 0.08 0.58 ± 0.02
Conclusion: In both cases Se results measured with ICP-OES were lower than the results measured with ICP-MS. However, the difference between the methods was not greater than the target value for the standard deviation for the proficiency assessment in this proficiency test.		

Critical steps for comparable results are temperature of the analysis, filtration and agitation. Especially analysis of Zn and Cu are sensitive to laboratory conditions. Different filtering devices might retain or dissolve compound, which will distort the results. Analysis of Pb has been shown to be very critical for filtration devices. It is therefore highly recommended that validation procedures for filtration devices should be taken into use as well as different filter material and type should be thoroughly tested before operational use. It has also been shown that different filter rates may affect analyses differently. Therefore some daily quality assurance procedures to assure the functioning of the filtering devices are strongly recommended.

3.2.1 Comparison of the results obtained in one stage and two stage test

According to the Government Decree 591/2006 for determining the leaching of harmful substances, the up-flow percolation test shall be used. The tests used for basic characterization of waste must always include those to be used for compliance testing (Official Journal of the European Communities 2003. 2003/33/EC). That means, in the basic characterization of homogeneous ashes, if possible, the up-flow percolation test CEN/TS 14405 and the compliance test EN 12457-3 should both be applied. One stage batch test should only be used if a sample is not suitable for two- stage batch test, e.g. because of technical or chemical reasons. Therefore it is highly recommended that all laboratories would include also two-step batch leaching test into their assortment of analytical methods.

In this proficiency test the results obtained from one stage batch leaching tests were compared to the results from the two stage batch leaching test by calculating the R1/R22 ratio for the major metal components and some other analytes (Figure 1). If the ratio is close to one, this indicates that one-step and two step analytics correspond with each other. If the ratio is significantly different for one laboratory compared to another, this indicates some discrepancies in the test or analytical methods which needs to be investigated in more detail (e.g. the switched results of lab 16 for Pb). This ratio was not calculated for participants 9 and 19 as participant number 9 reported results only for the two stage batch leaching test and participant number 19 reported results only for the one stage batch leaching test.

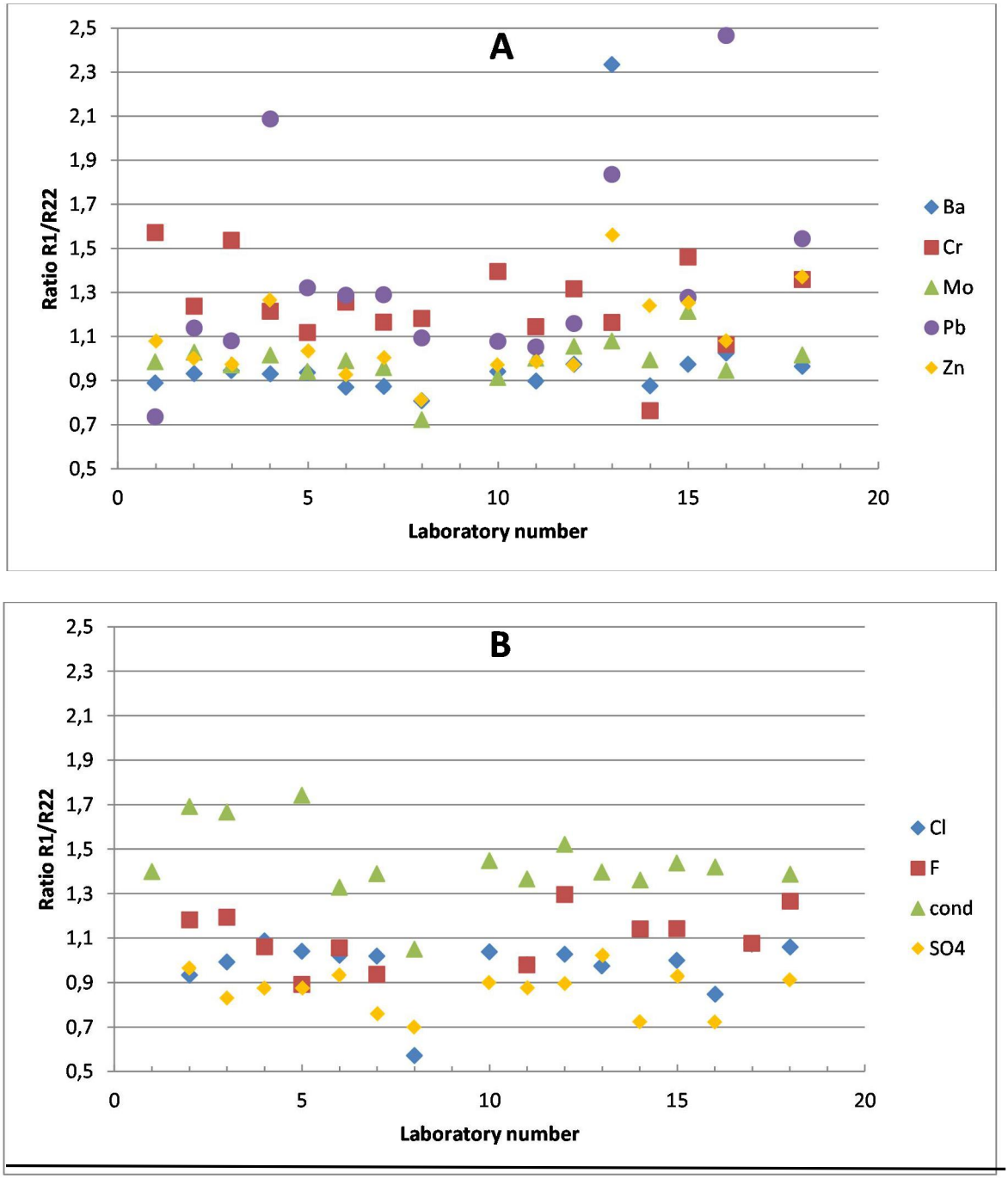

Figure 1. The ratio (R1/R22) of results reported by the participants for leached amount of some metals (A) and some other analytes (B).

3.3 Uncertainties of the results

In total, 14 participants reported their measurement uncertainties for the tested analytes. The most common method used for estimation of uncertainties was based on validation data, and also other methods were commonly used (Table 5). The uncertainties reported for the metals varied between 13-71 % and for the other analytes between 2-30 %. It is evident, that harmonization the estimating methods used for measurement uncertainties is needed. The new software tool – MUkit (measurement uncertainty kit), which based on the Nordtest method could be useful for this purpose [7]. This free software is available on the web-pages of the calibration laboratory (ENVICAL) of SYKE: www.syke.fi/envical.

Table 5. Methods used in the estimation of measurement uncertainties.

Uncertainty measurements were based on the following data	**Number of participant**
Internal quality assurance data from a synthetic sample	7, 13
Internal quality assurance data from a synthetic sample combined to results from the proficiency test	15, 16
Validation data	2, 3, 9, 10, 11, 12, 19
Other method (method not reported)	1, 18

4 EVALUATION OF PERFORMANCE

The evaluation of the participants was based on z values, which were calculated using the estimated target values for the total deviation. The z values shall be interpreted as follows:

Criteria	**Performance**
$\lvert z \rvert \leq 2$	Satisfactory
$2 < \lvert z \rvert < 3$	Questionable
$\lvert z \rvert \geq 3$	Unsatisfactory

In total, 81 % of the results were satisfactory when the deviations of 10–50 % from the assigned values were accepted (Appendix 9). For pH, deviation of 0.2 pH unit was accepted. SYKE arranged a similar proficiency test in 2008 in which 78 % of the results were satisfactory [6].

The satisfactory results varied between 71 % and 100 % depending on the analytes (Table 3). The performance criteria were stricter than in the previous proficiency test in 2008.

It should be noted that the analytical results of 2R1 are provided by KVVY and not by each participant. The evaluation of 2R1 results should therefore not be used for evaluation of competence of the participating laboratories, but differences in a laboratory's z values between sample R1 and 2R1 results reflect some discrepancies in the laboratory's leaching test procedures. These discrepancies may be due to the analytical processes of the elutes. For example, the z value for 2R1 is 0 for Se analysis in laboratory 8, but for sample R1, where metals have been analysed in their own laboratory, z value is 23.

Table 4. Summary of the performance evaluation in the proficiency test 10/2012. From each sample the following metals (As, Ba, Cd, Cr, Cu, Mo, Ni, Pb, Sb, Se, Zn) and anions (Cl^-, SO_4^{2-}, F) have been analysed. As, Cd, Cu, Ni, Sb, and V were not evaluated due to low concentration in the sample and corresponding high variation between participants.

Sample	Analyte	Satisfactory results (%)	Accepted deviation from the assigned value (%)	Remarks
R1	metals	85	20-50	
	anions	92	10-25	High uncertainty in the assigned value for F^-.
R21	metals	80	35-40	High uncertainty in the assigned value for Ba, Cr, Mo, Pb and Zn.
	anions	82	20-40	High uncertainty in the assigned value for F^-.
R22	metals	86	20-40	High uncertainty in the assigned value for Pb and Zn.
	anions	85	20-40	

6 SUMMARY

Proftest SYKE carried out this proficiency test for leaching testing of landfill wastes using one stage- and two stage batch leaching tests in October 2012. In total 19 laboratories took part in this test. Sample material was ash from recycled fuel and wood in which the main harmful components were Cl^-, Cr, Mo, Pb, Se SO_4^{2-} and Zn. The particle size of the sample was 0.006-0.063 mm and the total organic carbon (TOC) content of the sample was less than 5 g/kg dry weight. The following analyses were requested

- metals (As, Ba, Cd, Cr, Cu, Mo, Ni, Pb, Sb, Se, Zn)
- Cl^-, SO_4^{2-}, F^-, DOC, pH and conductivity

The standard methods EN 12457-2 (one stage batch leaching test) and EN 12457-3 (two stage batch leaching test) were used to determinate the leaching properties of studied components from the sample. Some differences in procedures used by the participants in the leaching tests were recorded for shaking the sample and separation of the eluate. It and it is likely that these differences affected the results.

The evaluation of the participating laboratories was done using z-scores. The amount of satisfactory results were slightly higher than in the previous proficiency test, 87%, when the total target deviations varied between 10-50 % for metals and 10 -40 % for anions.

6 YHTEENVETO

Proftest SYKE järjesti yhteistyössä Kokemäenjoen vesistön vesiensuojeluyhdistys ry:n (KVVY) kanssa pätevyyskokeen lokakuussa 2012, koskien liukoisuustestejä jätteiden kaatopaikkakelpoisuuden arvioimiseksi. Kaikkiaan 19 laboratoriota osallistui pätevyyskokeeseen. Näyte oli kierrätyspolttoaineen ja puun tuhkaa, jonka tärkeimmät haitta-aineet olivat Cl^-, Cr, Mo, Pb, Se, SO_4^{2-} ja Zn. Näytteen partikkelijakauma oli 0.006-0.063 mm ja orgaanisen aineen kokonaispitoisuus (TOC) oli alle 5 g kg kuiva painoa kohti. Näytteestä analysoitiin seuraavat parametrit:

- metallit (As, Ba, Cd, Cr, Cu, Mo, Ni, Pb, Sb, Se, Zn)
- Cl^-, SO_4^{2-}, F^-, DOC, pH ja sähkönjohtavuus

Määrityksissä käytettiin standardimenetelmiä EN 12457-2 (1-vaiheinen ravistelutesti) ja EN 12457-3 (2-vaiheinen ravistelutesti). Osallistujien näytteen ravisteluprosessista ja eluaatin erotusprosessista erosivat eri laboratorioissa ja on mahdollista että nämä erot vaikuttivat tuloksiin.

Osallistuvienlaboratorioiden pätevyydet arvioitiin z-arvoja käyttäen. Hyväksyttävien tulosten määrä oli hieman isompi kuin edellisessä pätevyyskokeessa, 87 %, kun kokonaishajonnan tavoitearvot vaihtelivat metalleille 10-50 % ja anioneille 10 -40 %.

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11. CEN/TS 14405. Characterization of waste - Leaching behavior tests - Up-flow percolation test (under specified conditions)

PARTICIPANTS

Country	Name of participant
Czech Rebublic	ALS Czech republic s.r.o., Prague
Finland	Boliden Harjavalta Oy, Harjavalta Ekokem Oy Ab, Riihimäki Enas, Jyväskylä Jyväskylän yliopisto, ympäristötutkimuskeskus, Jyväskylä KCL Kymen laboratorio Oy, Kuusankoski Kokemäenjoen vesistön vesiensuojeluyhdistys ry, Tampere Labtium Oy, Kuopio Novalab Oy, Karkkila Ramboll Analytics, Lahti SGS Inspection Services Oy, Kotka Suomen ympäristöpalvelu Oy, Oulu Teknologiakeskus KETEK Oy, Kokkola
Germany	Eurofins Umwelt ost GmbH, Germany
Greece	Laboratory of Metallurgy, Athens
Norway	Eurofins Environmental Testing Norway AS, Moss Norwegian Geotechnical Institute, Oslo
Sweden	ALS Scandinavia AB, Luleå Eurofins Environmental Testing Sweden AB, Linköping

RESULTS OF THE FEASIBILITY STUDY

The feasibility of the sample for one and two stage batch leaching tests was studied by comparing the results from inorganic substances and conductivity analyses using the R1/R22 ratio. This ratio was mainly close to one except for F^-.

	Concentration (mg/kg)			Ratio
Sample	**R1**	**R21**	**R22**	**R1/R22**
Measurement				
As	<0.05	<0.05	<0.05	
Ba	2.1	0.75	2.3	**0.9**
Cd	0.02	<0.02	0.02	**1.0**
Cl^-	16000	14000	14000	**1.1**
Conductivity	2090	5690	1500	**1.4**
Cr	7.1	4.1	5.2	**1.4**
Cu	<0.05	<0.05	<0.05	
DOC	<10	<10	<10	
F^-	34	9.1	17	**2.0**
Mo	5.6	5.2	5.9	**0.9**
Ni	<0.05	<0.05	<0.05	
Pb	7.5	2.0	5.6	**1.3**
pH	13	13	13	**1.0**
Sb	<0.05	<0.05	<0.05	
Se	0.75	0.78	0.82	**0.9**
SO_4^{2-}	25000	20000	26000	**1.0**
V	<0.05	<0.05	<0.05	
Zn	9.8	2.8	9.3	**1.1**

Conclusion: The sample was suitable for the proficiency test sample of both one and two stage batch leaching tests.

TESTING OF HOMOGENEITY AND DISTRIIBUTION OF PARTICLE SIZE

Homogeneity

Homogeneity testing was performed using six parallel samples with two analytical parallels per sample. Metal analytics was done as total concentration.

Measurement/ sample	Concentration (mg kg^{-1})	s_h %	s_h	s_a	s_a/s_h	Is s_a/s_h<0.5?	s_{bb}	s_{bb}^2	c	Is s_{bb}^2<c?
As	17.6	6	1.1	0.5	0.45	YES	0.35	0.12	0.62	YES
Ba	2265	6	136	65	0.48	YES	103	10690	10790	YES
Cd	17.9	4	0.7	0.2	0.29	YES	0.44	0.19	0.2	YES
Cr	111	9	10	4	0.4	YES	4.08	16.6	53.8	YES
Pb	258	10	26	3.9	0.15	YES	12.0	143.9	157.6	YES
Zn	3358	3	101	40	0.39	YES	68	4588	4776	YES

s_h % = standard deviation for testing of homogeneity

s_a = analytical deviation. standard deviation of the results in a sub sample

s_{bb} = between-sample deviation. standard deviation of the results between sub samples

$$c = F1 \bullet s_{all}^2 + F2 \bullet s_a^2$$

where:

$$s_{all}^2 = (0.3 s_p)^2$$

F1 = 1.88 and

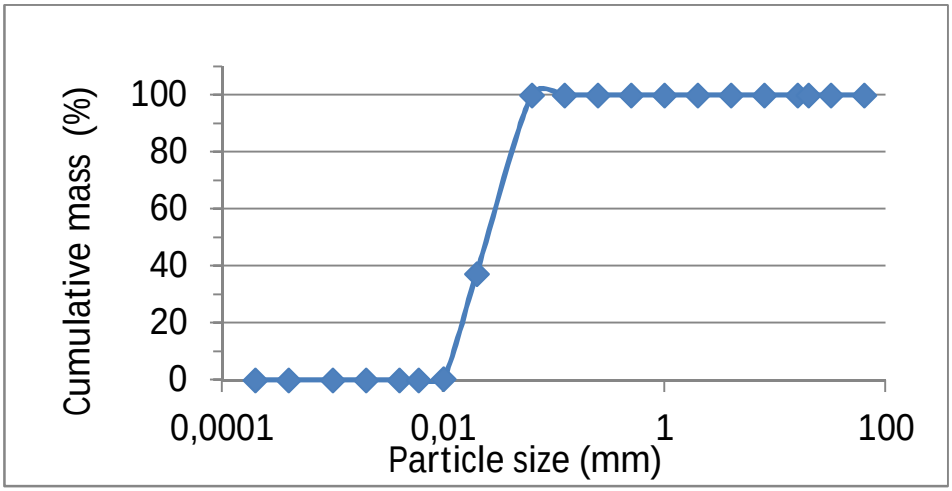
F2 = 1.01. when the number of sub samples is 10

Conclusion: The samples could be regarded as homogenous.

Particle size

Distribution of particle size was tested from one fly ash sample by using sedigraphy. The particle size of the sample was 0.006-0.063 mm (Figure 5).

Figure 5. The particle size of the ash sample measured by sedigraphy.



Conclusion: Particle size of the sample is < 4 mm

METHOD DESCRIPTIONS

One stage leaching test

Lab number	Date (D) Temperature (Te1) Method reference (Me)	Production of eluate: Mass of test portion, kg (Ma) Description of test portion (Mw) Volume of leachant, l (L)	Liquid –solid phase procedure: Description (D) Duration before separation, min (T1) Duration complete separation, min. (T2) Duration of centrifugation step (T3) Volume of eluate, l (VE) Temperature of eluate (Te2)
1	D: 20121119 Te1: 24 Me: EN 12457-2	Ma: 0,0903 Mw: Plastic bottles (HDPE), MilliQ water, mixing apparature (10rpm) for 24 H. L: 0,9	D: Deposition for 20 min, filtration (0.45 um membrane filter, 47 mm nitrocellulosa filter) T1: 20 T2: 40 T3: 10 VE: 0,825 Te2: 21
2	D: 20121120 Te1: 21 Me: EN12457-2 and -3	Ma: 0,0902 Mw: 1000 ml standard glass Schott bottle, turn-over head shaker L: 0,9	D: 0.45 µm PES and/or cellulose nitrate filter, filtration by suction (büchner funnel) and/or syringe T1: 15 T2: T3: VE: Te2: 21
3	D: 20121119-20121120 Te1: 23-24 Me: EN 12457-2 and EN 12457-3	Ma: 0,09024 Mw: Bottle: 1 l plastic bottle (HDPE), self-made extraction device 10 rpm L: 0,9	D: Vaccum filtration, Whatman NC45, pore size 0,45 µm, diameter 100 mm, fabric cellulose nitrate T1: 12 T2: 16 T3: VE: 0,808 Te2: 24,5
4	D: 20121119 Te1: room temperature Me: EN 12457-2 and EN 12457-3	Ma: 0,1 Mw: L: 1	D: T1: T2: T3: VE: Te2: room temperature
5	D: 20121119 Te1: 22 Me: EN 12457-2	Ma: 0,1 Mw: Glass bottle Duran Schott 1l, shaker Heidolph REAX 20, 15 rpm L: 1	D: excess pressure filtration , NC45 Whatman membrane filter 0,45 um (cellulose nitrate) T1: 1470 T2: T3: VE: Te2:

6	D: 20121119-20121120 Te1: 22,3 Me: EN 12457-2/3	Ma: 0,04509 Mw: 1 l Erlenmayer, glass. Orbital shaker, 50 rpm. L: 0,45	D: Millipore 0,45 µm, Nitrocellulose T1: 15 T2: 3 T3: VE: 0,405 Te2: 23,4
7	D: 20121119-20121120 Te1: 20,3 Me: EN 12457-2 and EN 12457-3	Ma: 0,0460779 Mw: Screw cap 1 l Kartell pe-plastic bottle. Shaker GFL 3040. Rotation speed 20 rpm. L: 0,45	D: Suction filtration using Büchner-funnel. Filter: Whatman ME25 nitrocellulose 0,45 µm, ø 100 mm. T1: 15 T2: 5 T3: VE: 0,419 Te2: 20,3
8	D: 20121119 Te1: 22-23 Me: EN 12457-2/3	Ma: 0,0903 Mw: Bottle: 1l polyethylene plastic jari. Orbital shaker GFL 3017, 170 rpm L: 0,8997	D: 1. Prefiltration with Buechner-funnel through 2,5 um filter paper. 2. Filtration using sintered glass filtration and 0,45 um filters. T1: 16 T2: 35 T3: VE: 0,813 Te2: 22
9	D: Te1: Me:	Ma: Mw: L:	D: T1: T2: T3: VE: T2:
10	D: 20121119-20121120 Te1: 20,5 Me:	Ma: 0,09 Mw: 1 l HDPE-bottle, end-over-end shaker 10 rpm, for 24 h L: 0,9	D: filtration using suction, prefiltration using glass fiber filtering device with 0,45 um membrane T1: 15 T2: 15 T3: VE: Te2: 20,5
11	D:20121119-20121120 Te1: 22 Me: EN 12457-2	Ma: 0,0902 Mw: Glassbottle 1l. Orbital shaker Gerhardt RS12, 10 rpm L: 0,8998	D: Whatman ME 25/21 STL 0,45 µm T1: 18 T2: 5 T3: VE: 0,83 Te2: 22,2
12	D: 20121119-20121120 Te1: 19,4-20,3 Me: in-house method, based on EN 12457-2/3 -standards.	Ma: 0,1003 Mw: Square 1 l bottle of PE plastic. Heidolph reax 20, rotation speed 7 rpm L: 0,9997	D: Cellulose nitrate filter 0,45 µm, no prefiltration, no centrifugation T1: 15 T2: 10 T3: VE: 0,92 Te2: 20,3
13	D: 20121119 Te1: 22 Me: EN 12457-2	Ma: 0,08784 Mw: 2 l glass bottle, Heidolph shaker L: 0,86063	D: centrifugation 10 min, 3000 rpm, filter 0,4 um (Whatman membrane) T1: 30 T2: 5 T3: VE: 0,7756 Te2: room temperature

14	D: 20121119-20121120 Te1: 21 Me: 38414-S4	Ma: 0,1 Mw: HDPE, 1l, Heidolph Reax20, 10 rpm L: 1	D: IC Acrodisc 25 mm Syringe Filter with 0,45 µm Supor Membranen T1: immediately T2: 5 T3: VE: 0,92 Te2: 21
15	D: 20121119-20121120 Te1: 22,2 Me: EN 12457- 2	Ma: 0,0901 Mw: Bucket designed 2,5 l container, PP, shaker Heidolph Reax 20, 8 rpm L: 0,9	D: Filter Durapore Membrane Filter 0,45 µm HV + prefiltration Millipore Glass Fibre Prefilter, no centrifugation T1: 20 T2: < 5 T3: VE: Te2:
16	D: 20121120 T1: 22,1 Me: EN 12457-213	Ma: 0,17552 Mw: End over end shaking apparatus at 10 RPM, 2 litre PP bottle L: 1,7495	D: PALL Life Sciences, Supor-450 0,45um 142mm membrane filter. Filtration: Sartarius pressure filtration apparatus using nitrogen gas. T1: 20 T2: 6 T3: VE: Te2: 22
17	D: 20121119 Te1: 22-24 Me:	Ma: 0,09 Mw: HDPE bottle 1 l capacity, rorary shaker 10 rpm L: 0,9	D: microfiltration using mixed cellulose ester filters with pore size 0,45µm T1: 15 T2: 30 T3: VE: 0,8 Te2: 22,8
18	D: 20121119-20121120 Te1: 21-23 Me:	Ma: 0,09012 Mw: two bottles 45,06 g raw material each / 1l brown glass bottles / shaking vertically with 5 rpm L: 0,900	D: The sample was decanted. Then filtrated over a 0,45µm hydrophilic polyether sulfone membrane. T1: 15 T2: 3 T3: VE: 0,825 Te2: 22
19	D: Te1: Me:	Ma: Mw: L:	D: T1: T2: T3: VE: Te2:

Two stage leaching test

Lab number	Date (D) Temperature (Te0)	Production of first eluate: Description of test portion (Mw) Description of extraction (De) Volume of leachant, l (L2) Duration before separation, min (T1) Volume of first filtrate, l (VE1) Temperature of first eluate (Te1) Duration of complete separation, min (T2) Duration of centrifugation, min (T3)	Production of second eluate: Volume of leachant, l (L8) Duration of complete separation, min (T4) Duration of centrifugation, min (T5) Volume of second filtrate, l (VE2) Temperature of second eluate (Te2)
1	D: 20121204 Te0: 23	Mw: Plastic bottles (HDPE), MilliQ water, mixing apparature (10rpm) for 5 h and 50 minutes. De: 4000 rpm in 10 minutes, filtration (0.45 um membranefilter, 47 mm nitrocellulose filter). L2: 0,348 T1: 15 VE1: 0,222 Te1: 21 T2: 25 T3:	L8: 1,4 T4: 15 T5: VE2: 1,406 Te2: 21
2	D: 20121120 Te0: 21	Mw: De: 0.45 µm PES and/or cellulose nitrate filter, filtration by suction (büchner funnel) and/or syringe L2: 0,2 T1: 15 VE1: 0,16 Te1: 21 T2: T3	L8: 0,8 T4: T5: VE2: Te2: 21
3	D: 20121127-20121128 Te0: 23-24	Mw: L/S2: 0,5 l plastic bottle (HDPE), Self-made extraction device 10 rpm. L/S8: 2,0 l plastic bottle (HDPE) Self-made extraction device 10 rpm. De: Vaccum filtration, Whatman NC45, 0,45 µm, diameter 100 mm, material cellulose nitrate. L2: 0,35 T1: 10 VE1: 0,266 Te1: 23 T2: 25 T3:	L8: 1,4 T4: 14 T5: VE2:1,32 Te2: 22

4	D: 20121120 Te0: room temperature	Mw: De: L2: 0,3495 T1: VE1: 0,21 Te1: room temperature T2: T3:	L8: T4: T5: VE2: Te2: room temperature
5	D: 20121120 Te0: 22	Mw: Glass bottle Duran Schott 1l, shaker Heidolph REAX 20, 15 rpm De: Excess pressure filtration, filter NC45 Whatman membrane filter 0,45 um (cellulose nitrate) L2: 0,2 T1: 30 VE1: 0,154 Te1: T2: 390 T3: 15	L8: 0,8 T4: 1110 T5: 15 VE2: Te2:
6	D: 20121121 Te0: 23,2	Mw: Erlenmayer-container, 1 l, glass. Orbital shaker, 50 rpm. De: Millipore 0,45 µm, Nitrocellulose L2: 0,349 T1: 15 VE1: 0,184 Te1: 23,4 T2: 2 T3:	L8: 1,4 T4: 10 T5: VE2: 1,38 Te2: 23,2
7	D: 20121120-20121121 Te0: 20	Mw: Screw cap 1 l Kartell pe-plastic bottle. Ravistelulaite GFL 3040. Rotation speed 20 rpm. De: Sucction filtration using Büchner-funnel. Filter: Whatman ME25 nitrocellulose membraanifilters 0,45 µm, ø 100 mm. L2: 0,175 T1: 15 VE1: 0,126 Te1: 20 T2: 5 T3	L8: 0,7 T4: 5 T5: VE2: not measured, whole sample was filtered Te2: 20,8
8	D: 20121121-20121122 Te0: 22-23	Mw: Bottle: 500 ml polyethylene plastic bottle. Orbital shaker GLF 3017, 170 rpm De: Liquid settled for 15 min and then filtered using sintered glass filtration device and 0,45 um filterpaper. L2: 0,349 T1: 15 VE1: 0,289 Te1: 21 T2: 15 T3	L8: 1,415 T4: 32 T5: VE2: 1,595 Te2: 21

9	D: 20121126-20121127 Te0: 20	Mw: PE bottles, 500ml ja 2000ml, HAM -shaker 10 rpm De: Imusuodatus, 045um/47mm L2: 0,349 T1: 5 VE1: 0,22 Te1: 20 T2: 15 T3	L8: 1,4 T4: 15 T5: VE2: Te2: 20
10	D: 20121120-20121121 Te0: 20,8	Mw: 0,5 l and 2 l HDPE-bottles, end-over-end shakers 10 rpm 6+18 h De: filtration using vaccum pump. Fitration using glass fiberfiltration device, 0,45 um membrane filters. L2: 0,35 T1: 15 VE1: 0,25 Te1: 21,2 T2: 15 T3	L8: 1,4 T4: 20 T5: VE2: Te2: 20,8
11	D: 20121210-20121212 Te0: 22	Mw: Glass bottle 500 ml. Orbital shaker Gerhardt RS12, 10 rpm De: Whatman ME 25/21 STL 0,45 µm L2: 0,35 T1: 20 VE1: 0,228 Te1: 22 T2: 4 T3:	L8: 1,4 T4: 15 T5: VE2: 0,293 Te2: 22,2
12	D: 20121121-20121122 Te0: 20-23,3	Mw: phase 1: square shaped PE bottle 0,5 l, phase 2: square shaped PE bottle 2 l. Heidolph reax 20, 7 rpm De: Cellulose nitrate filters 0,45µm, no prefiltration, no centrifugation L2: 0,3495 T1: 15 VE1: 0,2515 Te1: 20,4 T2: 3 T3:	L8: 1,3015 T4: 5 T5: VE2: 1,1 Te2: 20
13	D: 20121120-20121121 Te0: 22	Mw: First phase: 1 l glass bottle, Heidolph shaker,secund phase 2 l glass bottle. De: centrifugation 10 min 3000 rpm, filtration 0,4 um filters (Whatman membrane) L2: 0,33604 T1: 20 VE1: 0,1964 Te1: 22 T2: 5-10 T3: 2x10 min	L8: 1,3485 T4: 5 T5: VE2: Te2: 22

14	D: 20122219-20121120 Te0: 21	Mw: HDPE, 1l, Heidolph Reax20, 10 rpm De: Schleicher & Schuell 589 L2: 0,2 T1: immediately VE1: 0,115 Te1: 21 T2: 5 T3	L8: 0,8 T4: 5 T5: VE2: 0,8 Te2: 21
15	D: 20121129-20121130 Te0: 22,2	Mw:Phase 1: Bucket shaped 1,120 l PP container. Phase 2: Bucket shaped 2,5 l container of PP. Shaker Heidolph Reax 20,8 rpm De: Filter Durapore Membrane Filter 0,45 µm HV + prefiltration Millipore Glass Fibre Prefilter, no centrifugation L2: 0,3495 T1: 25 VE1: 0,225 Te1: 21,3 T2: 10 T3	L8: 1,4 T4: 10 T5: VE2: 1,37 Te2: 21,6
16	D: 20121218 Te0: 21,3	Mw: End over end shaking apparatus at 10 RPM, 2 litre PP bottle De: PALL Life Sciences, Supor-450 0,45um 142mm membrane filter. Filtration: Sartarius pressure filtration apparatus using nitrogen gas. L2: 0,3499 T1: 15 VE1: 0,2267 Te1: 21,6 T2: 6 T3	L8: 1,4 T4: T5: VE2: 1,368 Te2: 20,5
17	D: 20121213 Te0: 22-24	Mw: a stage: HDPE 500 ml, b stage: PP 2000 ml, rotary shaker 10rpm De: microfiltration using mixed cellulose ester filters with pore size 0,45µm L2: 0,349 T1: 15 VE1: 0,23 Te1: 22,7 T2: 30 T3	L8: 1,4 T4: T5: VE2: 1,3 Te2: 23,8

18	D: 20121126-20121128 Te0: 20-23	Mw: 1l brown glass bottle L/S 2 / shaking vertically with 5 rpm / separation / 2,5 l brown glass bottle with filter and material for L/S 8 / shaking vertically with 5 rpm De:The sample was decanted. Then filtrated over a 0,45µm hydrophilic polyether sulfone membrane. L2: 0,44 T1: 20 VE1: 0,26 Te1: 20 T2: 7 T3	L8: 1,76 T4: T5: VE2: 1,74 Te2: 20,5
19	D: Te0:	Mw: De: L2: T1: VE1: Te1: T2: T3	L8: T4: T5: VE2: Te2:

Analytical methods

Lab number	Analytical Methods:				
	Metals:	**DOC:**	**F:**	**Cl^-:**	**SO_4^{2-}:**
1	ICP-MS, AFS				
2	ICP-MS	EN1484	IC EN10304	IC EN10304	IC EN10304
3	ICP-MS	Shimazdu TOC-L analyser (SFS-EN1484)	IC	IC	IC
4	ICP-OES (Thermo AC A6500 Duo)	Shimazdu TOC-analyser	ISE/pH/mV/ORP-meter (Thermo) + fluoride selective electrode	ISE/pH/mV/ORP-meter (Thermo) + chloride selective electrode	Calculated S-result multiplied by 3.
10	ICP-MS	IR-detection, EN 1484	IC EN ISO 10304	IC EN ISO 10304	IC EN ISO 10304
11	ICP-MS		IC	IC	IC
15	ICP-OES	Burning at 800°C, IR-detection	IC EN ISO 10304	IC EN ISO 10304	IC EN ISO 10304
16	EPA methods (modified) 200.7 (ICP_AES) and 200.8 (ICP-AES)	EN 1484-H3	EN ISO 10304	EN ISO 10304	EN ISO 10304
17			EPA 4500-F-D, 18th ed. of Standard methods	APHA, Standard methods for the examination of water and waste water 4500-Cl-B Argentometric method	
18	ICP-MS EN ISO 17294-2	EN 1484	IC EN ISO 10304-1	IC EN ISO 10304-1	IC EN ISO10304-1
19	ICP-OES				

EVALUATION OF ASSIGNED VALUES

All assigned values and their uncertainties were calculated using robust statistics. **The reliability of the assigned value** was tested according to the criterion:

$u/s_p \leq 0.3$, where

u is the standard uncertainty of the assigned value
(the expanded uncertainty of the assigned value (U) divided by 2) and
s_p the standard deviation for proficiency assessment
(total standard deviation divided by 2).

Only the assigned values for Cl^-, conductivity, pH, Se and SO_4^{2-} can be considered reliable according to this criterion.

Measurement	Sample	Assigned value	U %	u/s_p
Ba	2R1	2.09	4.2	0.3
	R1	2.44	6.7	0.3
	R21	0.68	16.6	**0.4**
	R22	2.56	6.7	0.3
Cl	R1	14300	1.7	0.2
	R21	14100	4.1	0.2
	R22	14500	4.2	0.2
Cond	R1	2100	2.6	0.3
	R21	5740	4.3	0.2
	R22	1450	6.4	0.3
Cr	2R1	6.71	5.2	0.3
	R1	6.93	9.1	0.3
	R21	4.05	17.7	**0.4**
	R22	5.49	10.6	0.3
F	R1	14.9	12.4	**0.5**
	R21	4.31	21.4	**0.5**
	R22	13.8	11.4	0.3
Mo	2R1	5.74	1.4	0.1
	R1	6.42	9.1	0.3
	R21	5.36	14.7	**0.4**
	R22	6.42	10.4	0.3
Pb	2R1	6.54	3.3	0.22
	R1	6.52	12.1	0.2
	R21	1.93	23.8	**0.6**
	R22	5.53	14.1	**0.5**
pH	R1	12.7	0.6	0.2
	R21	12.9	0.7	0.2
	R22	12.7	0.7	0.2
Se	2R1	0.75	2.1	0.2
	R1	0.64	8.2	0.3
	R21	0.63	13.4	0.3
	R22	0.69	12.4	0.3
SO_4	R1	24800	5.6	0.3
	R21	20900	8.0	0.3
	R22	27600	4.9	0.2
Zn	2R1	10.6	5.3	0.3
	R1	9.6	10.0	0.3
	R21	2.85	14.6	**0.4**
	R22	9.35	12.8	**0.4**

TERMS IN THE RESULT TABLES

Sample	The code of the sample
z-Graphics	z score - the graphical presentation
z value	calculated as follows: $z = (x_i - X)/s_p$, where x_i = the result of the individual laboratory X = the assigned value s_p = the target value of the standard deviation for proficiency assessment.
zeta score	zeta= $(x_i - X)/\sqrt{u^2_{lab} + u^2 c}$, u_{lab} = the standard uncertainty of the participant's result u_c = the standard uncertainty of the assigned value
Outl test OK	yes - the result passed the outlier test H = Hampel test (a test for the mean value)
Assigned value	the reference value
Assigned value 2*U_C	the expanded uncertainty of the assigned value
2* Targ SD %, **Targ 2SD%**	the target value of total standard deviation for proficiency assessment (s_p) at 95 % confidence level
Lab's result	the result reported by the participant (the mean value of the replicates)
Md.	Median
Mean	Mean
Robust mean	Robust mean
SD	Standard deviation
SD%	Standard deviation, %
Passed	The results passed the outlier test
Outl. Failed	The result not passed the outlier test
Missing	i.e. < DL
Num of labs	the total number of the participants

Summary on the z scores

S – satisfactory ($-2 \leq z \leq 2$)
Q – questionable ($2 < z < 3$), positive error, the result deviates more than 2 * s_p from the assigned value
q – questionable ($-3 > z < -2$), negative error, the result deviates more than 2 * s_p from the assigned value
U – unsatisfactory ($z \geq 3$), positive error, the result deviates more than 3 * s_p from the assigned value
u – unsatisfactory ($z \leq -3$), negative error, the result deviates more than 3 * s_p from the assigned value

Robust analysis

The items of data is sorted into increasing order, x_1, x_2, x_i,…,x_p.

Initial values for x^* and s^* are calculated as:

x^* = median of x_i (i = 1, 2,…p)
s^* = 1.483 median of $|x_i - x^*|$ (i = 1, 2,…p)
The mean *x** and *s* are updated as follows:*

$\varphi = 1.5 s^*$

$x_i^* = x^* - \varphi$ if $x_i < x^* - \varphi$
$x_i^* = x^* + \varphi$ if $x_i > x^* + \varphi$
$x_i^* = x_i$ otherwise

The new values of x^* and s^* are calculated from:

$$s^* = 1.134\sqrt{\sum (x_i^* - x^*)^2 / (p-1)}$$

$$x^* = \sum x_i^* / p$$

The robust estimates x^* and s^* can be derived by an iterative calculation, i.e. by updating the values of x^* and s^* several times, until the process convergences.

Ref: Statistical methods for use in proficiency testing by inter laboratory comparisons, Annex C [3].

LIITE 7. RESULTS OF EACH PARTICIPANT

APPENDIX 7.

Analyte	Unit	Sample	z-Graphics -3 -2 -1 0 +1 +2 +3	Z- value	Outl test OK	Assig-ned value	2* Targ SD%	Lab's result	Md.	Mean	SD	SD%	Pas-sed	Outl. fai-led	Mis-sing	Num of labs
Laboratory 1																
As	mg/kg	2R1			yes			0,004	0,008	0,01	0,00756	75,6	14	1	1	16
	mg/kg	R1						<0,01	0,0075	0,01808	0,01984	109,	6	0	11	17
	mg/kg	R21						<0,004	0,004	0,01078	0,01394	129,	7	0	10	17
	mg/kg	R22						<0,01	0,01	0,04847	0,07201	148,	7	0	10	17
Ba	mg/kg	2R1		0,000	yes	2,09	15	2,09	2,04	2,072	0,1162	5,6	15	1	0	16
	mg/kg	R1		-0,123	yes	2,44	20	2,41	2,401	2,439	0,2026	8,3	15	2	0	17
	mg/kg	R21		0,206	yes	0,68	40	0,708	0,706	0,6694	0,1745	26,0	17	0	0	17
	mg/kg	R22		0,586	yes	2,56	20	2,71	2,51	2,526	0,3481	13,7	17	0	0	17
Cd	mg/kg	2R1			yes	0,016		0,016	0,016	0,01613	0,00051	3,2	15	1	0	16
	mg/kg	R1			yes			0,00416	0,00448	0,00568	0,00409	71,9	8	0	9	17
	mg/kg	R21			yes			0,00314	0,00472	0,00845	0,01217	144,	9	0	8	17
	mg/kg	R22			yes			0,00457	0,0068	0,00975	0,01189	121,	9	0	8	17
conductivity	mS/m	R1		0,381	yes	2100	10	2140	2095	2095	86,51	4,1	16	1	0	17
	mS/m	R21		0,871	yes	5740	20	6240	5750	5738	323,8	5,6	13	3	0	16
	mS/m	R22		0,552	yes	1450	20	1530	1435	1433	122,4	8,5	14	3	0	17
Cr	mg/kg	2R1		1,028	yes	6,71	20	7,40	6,795	6,599	0,76	11,5	16	0	0	16
	mg/kg	R1		1,876	yes	6,93	30	8,88	6,968	6,848	1,21	17,6	17	0	0	17
	mg/kg	R21		0,358	yes	4,05	40	4,34	4,3	4,059	1,049	25,8	17	0	0	17
	mg/kg	R22		0,194	yes	5,49	30	5,65	5,18	5,502	0,8711	15,8	17	0	0	17
Cu	mg/kg	R1			yes			0,0753	0,0356	0,06621	0,08269	124,	11	0	6	17
	mg/kg	R21			yes			0,00676	0,0142	0,0413	0,07963	192,	10	0	7	17
	mg/kg	R22			yes			0,03	0,03	0,07255	0,0863	118,	11	0	6	17
Mo	mg/kg	2R1		-0,070	yes	5,74	10	5,72	5,745	5,73	0,1372	2,4	16	0	0	16
	mg/kg	R1		-0,021	yes	6,42	30	6,4	6,602	6,387	0,9057	14,1	17	0	0	17
	mg/kg	R21		0,128	yes	5,36	35	5,48	5,51	5,274	1,357	25,7	17	0	0	17
	mg/kg	R22		0,083	yes	6,42	30	6,5	6,515	6,383	0,9603	15,0	16	1	0	17
Ni	mg/kg	2R1			yes			0,01	0,0155	0,01725	0,00952	55,2	16	0	0	16
	mg/kg	R1						<0,005	0,0099	0,03724	0,06586	176,	6	0	11	17
	mg/kg	R21						<0,001	0,0023	0,00862	0,01159	134,	7	0	10	17
	mg/kg	R22						<0,005	0,0119	0,04965	0,07216	145,	7	0	10	17
Pb	mg/kg	2R1		0,510	yes	6,54	15	6,79	6,605	6,605	0,3396	5,1	14	2	0	16
	mg/kg	R1		0,546	yes	6,52	50	7,41	6,615	6,554	1,491	22,7	16	1	0	17
	mg/kg	R21		1,321	yes	1,93	40	2,44	1,76	1,632	0,8389	51,3	16	1	0	17
	mg/kg	R22		1,049	yes	5,53	30	6,4	5,49	5,207	1,497	28,7	15	2	0	17
pH		R1		0,000	yes	12,7	3,1	12,7	12,7	12,7	0,1673	1,3	18	0	0	18
		R21		0,500	yes	12,9	3,1	13	12,88	12,86	0,1458	1,1	17	1	0	18
		R22		0,000	yes	12,7	3,1	12,7	12,67	12,65	0,1661	1,3	17	1	0	18
Sb	mg/kg	R1						<0,001	0,006	0,03287	0,05757	175,	4	0	13	17
	mg/kg	R21						<0,0002	0,00021	0,00196	0,00302	153,	5	0	12	17
	mg/kg	R22						<0,001	0,00049	0,02866	0,05794	202,	5	0	12	17
Se	mg/kg	2R1		0,267	yes	0,75	10	0,76	0,76	0,7482	0,02757	3,7	15	1	0	16
	mg/kg	R1		-0,525	yes	0,64	25	0,598	0,66	0,6409	0,07771	12,1	16	1	0	17
	mg/kg	R21		0,730	yes	0,63	40	0,722	0,6408	0,6019	0,1451	24,1	16	1	0	17
	mg/kg	R22		0,514	yes	0,69	40	0,761	0,6925	0,7006	0,1508	21,5	15	1	1	17
Zn	mg/kg	2R1		-0,028	yes	10,6	20	10,57	10,57	10,67	0,7406	6,9	15	1	0	16
	mg/kg	R1		0,903	yes	9,6	30	10,9	10	9,543	1,503	15,7	17	0	0	17
	mg/kg	R21		0,825	yes	2,85	40	3,32	2,92	2,517	0,8906	35,3	17	0	0	17
	mg/kg	R22		0,535	yes	9,35	30	10,1	9,95	9,51	1,666	17,5	16	1	0	17

Outlier test failed: C - Cohcran, G1 - Grubbs(1-outlier algorithm), G2 - Grubbs(2-outliers algorithm), H - Hampel, M - manual

Analyte	Unit	Sample	z-Graphics -3 -2 -1 0 +1 +2 +3	Z- value	Outl test OK	Assig-ned value	2* Targ SD%	Lab's result	Md.	Mean	SD	SD%	Pas-sed	Outl. fai-led	Mis-sing	Num of labs
Laboratory 2																
As	mg/kg	2R1			yes			0,005	0,008	0,01	0,00756	75,6	14	1	1	16
	mg/kg	R1						<0,050	0,0075	0,01808	0,01984	109,	6	0	11	17
	mg/kg	R21						<0,040	0,004	0,01078	0,01394	129,	7	0	10	17
	mg/kg	R22						<0,050	0,01	0,04847	0,07201	148,	7	0	10	17
Ba	mg/kg	2R1		-0,447	yes	2,09	15	2,02	2,04	2,072	0,1162	5,6	15	1	0	16
	mg/kg	R1		1,066	yes	2,44	20	2,7	2,401	2,439	0,2026	8,3	15	2	0	17
	mg/kg	R21		1,471	yes	0,68	40	0,88	0,706	0,6694	0,1745	26,0	17	0	0	17
	mg/kg	R22		1,328	yes	2,56	20	2,9	2,51	2,526	0,3481	13,7	17	0	0	17
Cd	mg/kg	2R1			yes	0,016		0,017	0,016	0,01613	0,00051	3,2	15	1	0	16
	mg/kg	R1						<0,0040	0,00448	0,00568	0,00409	71,9	8	0	9	17
	mg/kg	R21						<0,0040	0,00472	0,00845	0,01217	144,	9	0	8	17
	mg/kg	R22						<0,0040	0,0068	0,00975	0,01189	121,	9	0	8	17
Cl	mg/kg	R1		-0,420	yes	14300	10	14000	14300	14280	593	4,2	15	1	0	16
	mg/kg	R21		0,638	yes	14100	20	15000	14000	14130	1033	7,3	15	1	0	16
	mg/kg	R22		0,345	yes	14500	20	15000	14170	14360	905	6,3	14	2	0	16
conductivity	mS/m	R1		0,952	yes	2100	10	2200	2095	2095	86,51	4,1	16	1	0	17
	mS/m	R21		0,801	yes	5740	20	6200	5750	5738	323,8	5,6	13	3	0	16
	mS/m	R22		-1,034	yes	1450	20	1300	1435	1433	122,4	8,5	14	3	0	17
Cr	mg/kg	2R1		0,745	yes	6,71	20	7,21	6,795	6,599	0,76	11,5	16	0	0	16
	mg/kg	R1		0,837	yes	6,93	30	7,8	6,968	6,848	1,21	17,6	17	0	0	17
	mg/kg	R21		1,049	yes	4,05	40	4,9	4,3	4,059	1,049	25,8	17	0	0	17
	mg/kg	R22		0,984	yes	5,49	30	6,3	5,18	5,502	0,8711	15,8	17	0	0	17
Cu	mg/kg	R1						<0,20	0,0356	0,06621	0,08269	124,	11	0	6	17
	mg/kg	R21						<0,090	0,0142	0,0413	0,07963	192,	10	0	7	17
	mg/kg	R22						<0,20	0,03	0,07255	0,0863	118,	11	0	6	17
DOC	mg/kg	R1			yes			55	45,95	47,19	37,97	80,4	8	0	5	13
	mg/kg	R21			yes			27	8,779	19,06	22,91	120,	9	0	4	13
	mg/kg	R22			yes			67	31,77	54,98	72,57	131,	9	0	4	13
F	mg/kg	R1		-1,020	yes	14,9	25	13	16	14,88	2,404	16,1	11	4	2	17
	mg/kg	R21		0,104	yes	4,31	40	4,4	4,35	4,321	1,208	27,9	12	2	2	16
	mg/kg	R22		-1,014	yes	13,8	40	11	14,15	13,78	2,339	16,9	10	5	2	17
Mo	mg/kg	2R1		0,244	yes	5,74	10	5,81	5,745	5,73	0,1372	2,4	16	0	0	16
	mg/kg	R1		1,018	yes	6,42	30	7,4	6,602	6,387	0,9057	14,1	17	0	0	17
	mg/kg	R21		0,682	yes	5,36	35	6,0	5,51	5,274	1,357	25,7	17	0	0	17
	mg/kg	R22		0,810	yes	6,42	30	7,2	6,515	6,383	0,9603	15,0	16	1	0	17
Ni	mg/kg	2R1			yes			0,008	0,0155	0,01725	0,00952	55,2	16	0	0	16
	mg/kg	R1						<0,040	0,0099	0,03724	0,06586	176,	6	0	11	17
	mg/kg	R21						<0,040	0,0023	0,00862	0,01159	134,	7	0	10	17
	mg/kg	R22						<0,040	0,0119	0,04965	0,07216	145,	7	0	10	17
Pb	mg/kg	2R1		0,245	yes	6,54	15	6,66	6,605	6,605	0,3396	5,1	14	2	0	16
	mg/kg	R1		0,540	yes	6,52	50	7,4	6,615	6,554	1,491	22,7	16	1	0	17
	mg/kg	R21		0,959	yes	1,93	40	2,3	1,76	1,632	0,8389	51,3	16	1	0	17
	mg/kg	R22		1,169	yes	5,53	30	6,5	5,49	5,207	1,497	28,7	15	2	0	17
pH		R1		-0,508	yes	12,7	3,1	12,6	12,7	12,7	0,1673	1,3	18	0	0	18
		R21		-2,001	yes	12,9	3,1	12,5	12,88	12,86	0,1458	1,1	17	1	0	18
		R22		0,508	yes	12,7	3,1	12,8	12,67	12,65	0,1661	1,3	17	1	0	18
Sb	mg/kg	R1						<0,20	0,006	0,03287	0,05757	175,	4	0	13	17
	mg/kg	R21						<0,20	0,00021	0,00196	0,00302	153,	5	0	12	17
	mg/kg	R22						<0,20	0,00049	0,02866	0,05794	202,	5	0	12	17
Se	mg/kg	2R1		0,533	yes	0,75	10	0,77	0,76	0,7482	0,02757	3,7	15	1	0	16
	mg/kg	R1		1,500	yes	0,64	25	0,76	0,66	0,6409	0,07771	12,1	16	1	0	17
	mg/kg	R21		0,635	yes	0,63	40	0,71	0,6408	0,6019	0,1451	24,1	16	1	0	17
	mg/kg	R22		0,507	yes	0,69	40	0,76	0,6925	0,7006	0,1508	21,5	15	1	1	17
SO4	mg/kg	R1		1,290	yes	24800	20	28000	24650	24790	2474	10	16	0	0	16
	mg/kg	R21		0,421	yes	20900	25	22000	20580	20530	2799	13,6	15	1	0	16
	mg/kg	R22		0,507	yes	27600	20	29000	27150	27940	2524	9	15	1	0	16
V	mg/kg	2R1			yes			0,005	0,006	0,00673	0,00291	43,2	15	0	0	15
	mg/kg	R1						<0,04	0,00382	0,00325	0,00173	53,1	6	0	10	16
	mg/kg	R21						<0,02	0,00219	0,00188	0,00108	57,5	6	0	10	16
	mg/kg	R22						<0,04	0,00487	0,00479	0,00327	68,4	6	0	10	16
Zn	mg/kg	2R1		0,283	yes	10,6	20	10,90	10,57	10,67	0,7406	6,9	15	1	0	16
	mg/kg	R1		1,667	yes	9,6	30	12	10	9,543	1,503	15,7	17	0	0	17
	mg/kg	R21		0,965	yes	2,85	40	3,4	2,92	2,517	0,8906	35,3	17	0	0	17
	mg/kg	R22		1,889	yes	9,35	30	12	9,95	9,51	1,666	17,5	16	1	0	17

Outlier test failed: C - Cohcran, G1 - Grubbs(1-outlier algorithm), G2 - Grubbs(2-outliers algorithm), H - Hampel, M - manual

Analyte	Unit	Sample	z-Graphics -3 -2 -1 0 +1 +2 +3	Z- value	Outl test OK	Assig-ned value	2* Targ SD%	Lab's result	Md.	Mean	SD	SD%	Pas-sed	Outl. fai-led	Mis-sing	Num of labs
Laboratory 3																
As	mg/kg	2R1			yes			0,01	0,008	0,01	0,00756	75,6	14	1	1	16
	mg/kg	R1						<0,15	0,0075	0,01808	0,01984	109,	6	0	11	17
	mg/kg	R21						<0,03	0,004	0,01078	0,01394	129,	7	0	10	17
	mg/kg	R22						<0,15	0,01	0,04847	0,07201	148,	7	0	10	17
Ba	mg/kg	2R1		-0,383	yes	2,09	15	2,03	2,04	2,072	0,1162	5,6	15	1	0	16
	mg/kg	R1		-0,287	yes	2,44	20	2,37	2,401	2,439	0,2026	8,3	15	2	0	17
	mg/kg	R21		0,368	yes	0,68	40	0,73	0,706	0,6694	0,1745	26,0	17	0	0	17
	mg/kg	R22		-0,195	yes	2,56	20	2,51	2,51	2,526	0,3481	13,7	17	0	0	17
Cd	mg/kg	2R1			yes	0,016		0,016	0,016	0,01613	0,00051	3,2	15	1	0	16
	mg/kg	R1						<0,015	0,00448	0,00568	0,00409	71,9	8	0	9	17
	mg/kg	R21						<0,003	0,00472	0,00845	0,01217	144,	9	0	8	17
	mg/kg	R22						<0,015	0,0068	0,00975	0,01189	121,	9	0	8	17
Cl	mg/kg	R1		-0,140	yes	14300	10	14200	14300	14280	593	4,2	15	1	0	16
	mg/kg	R21		0,425	yes	14100	20	14700	14000	14130	1033	7,3	15	1	0	16
	mg/kg	R22		-0,138	yes	14500	20	14300	14170	14360	905	6,3	14	2	0	16
conductivity	mS/m	R1		0,476	yes	2100	10	2150	2095	2095	86,51	4,1	16	1	0	17
	mS/m	R21		-0,209	yes	5740	20	5620	5750	5738	323,8	5,6	13	3	0	16
	mS/m	R22		-1,103	yes	1450	20	1290	1435	1433	122,4	8,5	14	3	0	17
Cr	mg/kg	2R1		0,343	yes	6,71	20	6,94	6,795	6,599	0,76	11,5	16	0	0	16
	mg/kg	R1		0,519	yes	6,93	30	7,47	6,968	6,848	1,21	17,6	17	0	0	17
	mg/kg	R21		-0,790	yes	4,05	40	3,41	4,3	4,059	1,049	25,8	17	0	0	17
	mg/kg	R22		-0,765	yes	5,49	30	4,86	5,18	5,502	0,8711	15,8	17	0	0	17
Cu	mg/kg	R1						<0,1	0,0356	0,06621	0,08269	124,	11	0	6	17
	mg/kg	R21						<0,02	0,0142	0,0413	0,07963	192,	10	0	7	17
	mg/kg	R22						<0,1	0,03	0,07255	0,0863	118,	11	0	6	17
DOC	mg/kg	R1						<25	45,95	47,19	37,97	80,4	8	0	5	13
	mg/kg	R21						<5	8,779	19,06	22,91	120,	9	0	4	13
	mg/kg	R22						<25	31,77	54,98	72,57	131,	9	0	4	13
F	mg/kg	R1		1,557	yes	14,9	25	17,8	16	14,88	2,404	16,1	11	4	2	17
	mg/kg	R21		1,740	yes	4,31	40	5,81	4,35	4,321	1,208	27,9	12	2	2	16
	mg/kg	R22		0,399	yes	13,8	40	14,9	14,15	13,78	2,339	16,9	10	5	2	17
Mo	mg/kg	2R1		0,488	yes	5,74	10	5,88	5,745	5,73	0,1372	2,4	16	0	0	16
	mg/kg	R1		0,488	yes	6,42	30	6,89	6,602	6,387	0,9057	14,1	17	0	0	17
	mg/kg	R21		0,917	yes	5,36	35	6,22	5,51	5,274	1,357	25,7	17	0	0	17
	mg/kg	R22		0,706	yes	6,42	30	7,10	6,515	6,383	0,9603	15,0	16	1	0	17
Ni	mg/kg	2R1			yes			0,031	0,0155	0,01725	0,00952	55,2	16	0	0	16
	mg/kg	R1						<0,1	0,0099	0,03724	0,06586	176,	6	0	11	17
	mg/kg	R21						<0,02	0,0023	0,00862	0,01159	134,	7	0	10	17
	mg/kg	R22						<0,1	0,0119	0,04965	0,07216	145,	7	0	10	17
Pb	mg/kg	2R1		-0,612	yes	6,54	15	6,24	6,605	6,605	0,3396	5,1	14	2	0	16
	mg/kg	R1		0,307	yes	6,52	50	7,02	6,615	6,554	1,491	22,7	16	1	0	17
	mg/kg	R21		1,736	yes	1,93	40	2,60	1,76	1,632	0,8389	51,3	16	1	0	17
	mg/kg	R22		1,169	yes	5,53	30	6,50	5,49	5,207	1,497	28,7	15	2	0	17
pH		R1		0,000	yes	12,7	3,1	12,7	12,7	12,7	0,1673	1,3	18	0	0	18
		R21		-0,500	yes	12,9	3,1	12,8	12,88	12,86	0,1458	1,1	17	1	0	18
		R22		-1,016	yes	12,7	3,1	12,5	12,67	12,65	0,1661	1,3	17	1	0	18
Sb	mg/kg	R1						<0,05	0,006	0,03287	0,05757	175,	4	0	13	17
	mg/kg	R21						<0,01	0,00021	0,00196	0,00302	153,	5	0	12	17
	mg/kg	R22						<0,05	0,00049	0,02866	0,05794	202,	5	0	12	17
Se	mg/kg	2R1		-0,267	yes	0,75	10	0,74	0,76	0,7482	0,02757	3,7	15	1	0	16
	mg/kg	R1		0,500	yes	0,64	25	0,68	0,66	0,6409	0,07771	12,1	16	1	0	17
	mg/kg	R21		0,397	yes	0,63	40	0,68	0,6408	0,6019	0,1451	24,1	16	1	0	17
	mg/kg	R22		0,072	yes	0,69	40	0,70	0,6925	0,7006	0,1508	21,5	15	1	1	17
SO4	mg/kg	R1		-0,121	yes	24800	20	24500	24650	24790	2474	10	16	0	0	16
	mg/kg	R21		0,038	yes	20900	25	21000	20580	20530	2799	13,6	15	1	0	16
	mg/kg	R22		0,688	yes	27600	20	29500	27150	27940	2524	9	15	1	0	16
V	mg/kg	2R1			yes			0,008	0,006	0,00673	0,00291	43,2	15	0	0	15
	mg/kg	R1						<0,05	0,00382	0,00325	0,00173	53,1	6	0	10	16
	mg/kg	R21						<0,01	0,00219	0,00188	0,00108	57,5	6	0	10	16
	mg/kg	R22						<0,05	0,00487	0,00479	0,00327	68,4	6	0	10	16
Zn	mg/kg	2R1		-0,189	yes	10,6	20	10,40	10,57	10,67	0,7406	6,9	15	1	0	16
	mg/kg	R1		0,028	yes	9,6	30	9,64	10	9,543	1,503	15,7	17	0	0	17
	mg/kg	R21		0,123	yes	2,85	40	2,92	2,92	2,517	0,8906	35,3	17	0	0	17
	mg/kg	R22		0,392	yes	9,35	30	9,90	9,95	9,51	1,666	17,5	16	1	0	17

Analyte	Unit	Sample	z-Graphics -3 -2 -1 0 +1 +2 +3	Z- value	Outl test OK	Assig-ned value	2* Targ SD%	Lab's result	Md.	Mean	SD	SD%	Pas-sed	Outl. fai-led	Mis-sing	Num of labs
Laboratory 4																
As	mg/kg	2R1			yes			0,009	0,008	0,01	0,00756	75,6	14	1	1	16
	mg/kg	R1			yes			0,0467	0,0075	0,01808	0,01984	109,	6	0	11	17
	mg/kg	R21			yes			0,0057	0,004	0,01078	0,01394	129,	7	0	10	17
	mg/kg	R22			yes			0,0515	0,01	0,04847	0,07201	148,	7	0	10	17
Ba	mg/kg	2R1		-0,766	yes	2,09	15	1,97	2,04	2,072	0,1162	5,6	15	1	0	16
	mg/kg	R1		-0,910	yes	2,44	20	2,218	2,401	2,439	0,2026	8,3	15	2	0	17
	mg/kg	R21		-2,125	yes	0,68	40	0,391	0,706	0,6694	0,1745	26,0	17	0	0	17
	mg/kg	R22		-0,691	yes	2,56	20	2,383	2,51	2,526	0,3481	13,7	17	0	0	17
Cd	mg/kg	2R1			yes	0,016		0,016	0,016	0,01613	0,00051	3,2	15	1	0	16
	mg/kg	R1			yes			0	0,00448	0,00568	0,00409	71,9	8	0	9	17
	mg/kg	R21			yes			0	0,00472	0,00845	0,01217	144,	9	0	8	17
	mg/kg	R22			yes			0	0,0068	0,00975	0,01189	121,	9	0	8	17
Cl	mg/kg	R1		12,590	H	14300	10	23300	14300	14280	593	4,2	15	1	0	16
	mg/kg	R21		-1,085	yes	14100	20	12570	14000	14130	1033	7,3	15	1	0	16
	mg/kg	R22		4,783	H	14500	20	21436	14170	14360	905	6,3	14	2	0	16
Cr	mg/kg	2R1		-1,013	yes	6,71	20	6,03	6,795	6,599	0,76	11,5	16	0	0	16
	mg/kg	R1		-1,409	yes	6,93	30	5,465	6,968	6,848	1,21	17,6	17	0	0	17
	mg/kg	R21		-2,101	yes	4,05	40	2,348	4,3	4,059	1,049	25,8	17	0	0	17
	mg/kg	R22		-1,205	yes	5,49	30	4,498	5,18	5,502	0,8711	15,8	17	0	0	17
Cu	mg/kg	R1			yes			0	0,0356	0,06621	0,08269	124,	11	0	6	17
	mg/kg	R21			yes			0	0,0142	0,0413	0,07963	192,	10	0	7	17
	mg/kg	R22			yes			0	0,03	0,07255	0,0863	118,	11	0	6	17
DOC	mg/kg	R1			yes			42	45,95	47,19	37,97	80,4	8	0	5	13
	mg/kg	R21			yes			7,2	8,779	19,06	22,91	120,	9	0	4	13
	mg/kg	R22			yes			36	31,77	54,98	72,57	131,	9	0	4	13
F	mg/kg	R1		1,020	yes	14,9	25	16,80	16	14,88	2,404	16,1	11	4	2	17
	mg/kg	R21		-0,719	yes	4,31	40	3,69	4,35	4,321	1,208	27,9	12	2	2	16
	mg/kg	R22		0,736	yes	13,8	40	15,83	14,15	13,78	2,339	16,9	10	5	2	17
Mo	mg/kg	2R1		0,104	yes	5,74	10	5,77	5,745	5,73	0,1372	2,4	16	0	0	16
	mg/kg	R1		-1,199	yes	6,42	30	5,265	6,602	6,387	0,9057	14,1	17	0	0	17
	mg/kg	R21		-2,934	yes	5,36	35	2,608	5,51	5,274	1,357	25,7	17	0	0	17
	mg/kg	R22		-1,281	yes	6,42	30	5,186	6,515	6,383	0,9603	15,0	16	1	0	17
Ni	mg/kg	2R1			yes			0,018	0,0155	0,01725	0,00952	55,2	16	0	0	16
	mg/kg	R1			yes			0,0098	0,0099	0,03724	0,06586	176,	6	0	11	17
	mg/kg	R21			yes			0,0023	0,0023	0,00862	0,01159	134,	7	0	10	17
	mg/kg	R22			yes			0,0119	0,0119	0,04965	0,07216	145,	7	0	10	17
Pb	mg/kg	2R1		-11,480	H	6,54	15	0,91	6,605	6,605	0,3396	5,1	14	2	0	16
	mg/kg	R1		-3,457	H	6,52	50	0,885	6,615	6,554	1,491	22,7	16	1	0	17
	mg/kg	R21		-4,699	yes	1,93	40	0,116	1,76	1,632	0,8389	51,3	16	1	0	17
	mg/kg	R22		-6,156	M	5,53	30	0,424	5,49	5,207	1,497	28,7	15	2	0	17
pH		R1		0,610	yes	12,7	3,1	12,82	12,7	12,7	0,1673	1,3	18	0	0	18
		R21		0,500	yes	12,9	3,1	13,00	12,88	12,86	0,1458	1,1	17	1	0	18
		R22		0,152	yes	12,7	3,1	12,73	12,67	12,65	0,1661	1,3	17	1	0	18
Sb	mg/kg	R1			yes			0,119	0,006	0,03287	0,05757	175,	4	0	13	17
	mg/kg	R21			yes			0,0070	0,00021	0,00196	0,00302	153,	5	0	12	17
	mg/kg	R22			yes			0,132	0,00049	0,02866	0,05794	202,	5	0	12	17
Se	mg/kg	2R1		0,267	yes	0,75	10	0,76	0,76	0,7482	0,02757	3,7	15	1	0	16
	mg/kg	R1		0,475	yes	0,64	25	0,678	0,66	0,6409	0,07771	12,1	16	1	0	17
	mg/kg	R21		-2,460	yes	0,63	40	0,320	0,6408	0,6019	0,1451	24,1	16	1	0	17
	mg/kg	R22		-0,681	yes	0,69	40	0,596	0,6925	0,7006	0,1508	21,5	15	1	1	17
SO4	mg/kg	R1		0,171	yes	24800	20	25224	24650	24790	2474	10	16	0	0	16
	mg/kg	R21		-2,691	yes	20900	25	13871	20580	20530	2799	13,6	15	1	0	16
	mg/kg	R22		0,448	yes	27600	20	28837	27150	27940	2524	9	15	1	0	16
V	mg/kg	2R1			yes			0,007	0,006	0,00673	0,00291	43,2	15	0	0	15
	mg/kg	R1			yes			0	0,00382	0,00325	0,00173	53,1	6	0	10	16
	mg/kg	R21			yes			0	0,00219	0,00188	0,00108	57,5	6	0	10	16
	mg/kg	R22			yes			0	0,00487	0,00479	0,00327	68,4	6	0	10	16
Zn	mg/kg	2R1		-2,925	H	10,6	20	7,50	10,57	10,67	0,7406	6,9	15	1	0	16
	mg/kg	R1		-2,135	yes	9,6	30	6,526	10	9,543	1,503	15,7	17	0	0	17
	mg/kg	R21		-3,140	yes	2,85	40	1,060	2,92	2,517	0,8906	35,3	17	0	0	17
	mg/kg	R22		-2,988	H	9,35	30	5,159	9,95	9,51	1,666	17,5	16	1	0	17

Outlier test failed: C - Cohcran, G1 - Grubbs(1-outlier algorithm), G2 - Grubbs(2-outliers algorithm), H - Hampel, M - manual

Analyte	Unit	Sample	z-Graphics -3 -2 -1 0 +1 +2 +3	Z- value	Outl test OK	Assig-ned value	2* Targ SD%	Lab's result	Md.	Mean	SD	SD%	Pas-sed	Outl. fai-led	Mis-sing	Num of labs
Laboratory 5																
As	mg/kg	2R1			yes			0,008	0,008	0,01	0,00756	75,6	14	1	1	16
	mg/kg	R1						<0,2	0,0075	0,01808	0,01984	109,	6	0	11	17
	mg/kg	R21						<0,2	0,004	0,01078	0,01394	129,	7	0	10	17
	mg/kg	R22						<0,2	0,01	0,04847	0,07201	148,	7	0	10	17
Ba	mg/kg	2R1		-1,148	yes	2,09	15	1,91	2,04	2,072	0,1162	5,6	15	1	0	16
	mg/kg	R1		-0,451	yes	2,44	20	2,33	2,401	2,439	0,2026	8,3	15	2	0	17
	mg/kg	R21		1,029	yes	0,68	40	0,82	0,706	0,6694	0,1745	26,0	17	0	0	17
	mg/kg	R22		-0,273	yes	2,56	20	2,49	2,51	2,526	0,3481	13,7	17	0	0	17
Cd	mg/kg	2R1			yes	0,016		0,016	0,016	0,01613	0,00051	3,2	15	1	0	16
	mg/kg	R1						<0,01	0,00448	0,00568	0,00409	71,9	8	0	9	17
	mg/kg	R21						<0,01	0,00472	0,00845	0,01217	144,	9	0	8	17
	mg/kg	R22						<0,01	0,0068	0,00975	0,01189	121,	9	0	8	17
Cl	mg/kg	R1		0,394	yes	14300	10	14582	14300	14280	593	4,2	15	1	0	16
	mg/kg	R21		-0,244	yes	14100	20	13756	14000	14130	1033	7,3	15	1	0	16
	mg/kg	R22		-0,337	yes	14500	20	14012	14170	14360	905	6,3	14	2	0	16
conductivity	mS/m	R1		-0,238	yes	2100	10	2075	2095	2095	86,51	4,1	16	1	0	17
	mS/m	R21		-9,990	H	5740	20	5,7	5750	5738	323,8	5,6	13	3	0	16
	mS/m	R22		-1,786	yes	1450	20	1191	1435	1433	122,4	8,5	14	3	0	17
Cr	mg/kg	2R1		0,283	yes	6,71	20	6,90	6,795	6,599	0,76	11,5	16	0	0	16
	mg/kg	R1		0,635	yes	6,93	30	7,59	6,968	6,848	1,21	17,6	17	0	0	17
	mg/kg	R21		1,654	yes	4,05	40	5,39	4,3	4,059	1,049	25,8	17	0	0	17
	mg/kg	R22		1,579	yes	5,49	30	6,79	5,18	5,502	0,8711	15,8	17	0	0	17
Cu	mg/kg	R1						<0,1	0,0356	0,06621	0,08269	124,	11	0	6	17
	mg/kg	R21						<0,1	0,0142	0,0413	0,07963	192,	10	0	7	17
	mg/kg	R22						<0,1	0,03	0,07255	0,0863	118,	11	0	6	17
DOC	mg/kg	R1			yes			7,16	45,95	47,19	37,97	80,4	8	0	5	13
	mg/kg	R21						<5	8,779	19,06	22,91	120,	9	0	4	13
	mg/kg	R22			yes			23,24	31,77	54,98	72,57	131,	9	0	4	13
F	mg/kg	R1		0,789	yes	14,9	25	16,37	16	14,88	2,404	16,1	11	4	2	17
	mg/kg	R21		0,951	yes	4,31	40	5,13	4,35	4,321	1,208	27,9	12	2	2	16
	mg/kg	R22		1,652	yes	13,8	40	18,36	14,15	13,78	2,339	16,9	10	5	2	17
Mo	mg/kg	2R1		-0,279	yes	5,74	10	5,66	5,745	5,73	0,1372	2,4	16	0	0	16
	mg/kg	R1		0,332	yes	6,42	30	6,74	6,602	6,387	0,9057	14,1	17	0	0	17
	mg/kg	R21		0,885	yes	5,36	35	6,19	5,51	5,274	1,357	25,7	17	0	0	17
	mg/kg	R22		0,768	yes	6,42	30	7,16	6,515	6,383	0,9603	15,0	16	1	0	17
Ni	mg/kg	2R1			yes			0,023	0,0155	0,01725	0,00952	55,2	16	0	0	16
	mg/kg	R1						<0,1	0,0099	0,03724	0,06586	176,	6	0	11	17
	mg/kg	R21						<0,1	0,0023	0,00862	0,01159	134,	7	0	10	17
	mg/kg	R22						<0,1	0,0119	0,04965	0,07216	145,	7	0	10	17
Pb	mg/kg	2R1		0,917	yes	6,54	15	6,99	6,605	6,605	0,3396	5,1	14	2	0	16
	mg/kg	R1		0,067	yes	6,52	50	6,63	6,615	6,554	1,491	22,7	16	1	0	17
	mg/kg	R21		0,596	yes	1,93	40	2,16	1,76	1,632	0,8389	51,3	16	1	0	17
	mg/kg	R22		-0,615	yes	5,53	30	5,02	5,49	5,207	1,497	28,7	15	2	0	17
pH		R1		-1,168	yes	12,7	3,1	12,47	12,7	12,7	0,1673	1,3	18	0	0	18
		R21		-1,150	yes	12,9	3,1	12,67	12,88	12,86	0,1458	1,1	17	1	0	18
		R22		-1,880	yes	12,7	3,1	12,33	12,67	12,65	0,1661	1,3	17	1	0	18
Sb	mg/kg	R1						<0,01	0,006	0,03287	0,05757	175,	4	0	13	17
	mg/kg	R21						<0,01	0,00021	0,00196	0,00302	153,	5	0	12	17
	mg/kg	R22						<0,01	0,00049	0,02866	0,05794	202,	5	0	12	17
Se	mg/kg	2R1		-0,533	yes	0,75	10	0,73	0,76	0,7482	0,02757	3,7	15	1	0	16
	mg/kg	R1		-0,500	yes	0,64	25	0,60	0,66	0,6409	0,07771	12,1	16	1	0	17
	mg/kg	R21		0,397	yes	0,63	40	0,68	0,6408	0,6019	0,1451	24,1	16	1	0	17
	mg/kg	R22		0,145	yes	0,69	40	0,71	0,6925	0,7006	0,1508	21,5	15	1	1	17
SO4	mg/kg	R1		-0,517	yes	24800	20	23518	24650	24790	2474	10	16	0	0	16
	mg/kg	R21		-0,606	yes	20900	25	19317	20580	20530	2799	13,6	15	1	0	16
	mg/kg	R22		-0,267	yes	27600	20	26863	27150	27940	2524	9	15	1	0	16
V	mg/kg	2R1			yes			0,008	0,006	0,00673	0,00291	43,2	15	0	0	15
	mg/kg	R1						<0,1	0,00382	0,00325	0,00173	53,1	6	0	10	16
	mg/kg	R21						<0,1	0,00219	0,00188	0,00108	57,5	6	0	10	16
	mg/kg	R22						<0,1	0,00487	0,00479	0,00327	68,4	6	0	10	16
Zn	mg/kg	2R1		0,660	yes	10,6	20	11,30	10,57	10,67	0,7406	6,9	15	1	0	16
	mg/kg	R1		0,674	yes	9,6	30	10,57	10	9,543	1,503	15,7	17	0	0	17
	mg/kg	R21		0,632	yes	2,85	40	3,21	2,92	2,517	0,8906	35,3	17	0	0	17
	mg/kg	R22		0,620	yes	9,35	30	10,22	9,95	9,51	1,666	17,5	16	1	0	17

Outlier test failed: C - Cohcran, G1 - Grubbs(1-outlier algorithm), G2 - Grubbs(2-outliers algorithm), H - Hampel, M - manual

Analyte	Unit	Sample	z-Graphics -3 -2 -1 0 +1 +2 +3	Z- value	Outl test OK	Assig-ned value	2* Targ SD%	Lab's result	Md.	Mean	SD	SD%	Pas-sed	Outl. fai-led	Mis-sing	Num of labs
Laboratory 6																
As	mg/kg	2R1			yes			0,006	0,008	0,01	0,00756	75,6	14	1	1	16
	mg/kg	R1			yes			0,0050	0,0075	0,01808	0,01984	109,	6	0	11	17
	mg/kg	R21			yes			0,0026	0,004	0,01078	0,01394	129,	7	0	10	17
	mg/kg	R22			yes			0,0058	0,01	0,04847	0,07201	148,	7	0	10	17
Ba	mg/kg	2R1		0,638	yes	2,09	15	2,19	2,04	2,072	0,1162	5,6	15	1	0	16
	mg/kg	R1		-0,161	yes	2,44	20	2,4007	2,401	2,439	0,2026	8,3	15	2	0	17
	mg/kg	R21		1,815	yes	0,68	40	0,9268	0,706	0,6694	0,1745	26,0	17	0	0	17
	mg/kg	R22		0,778	yes	2,56	20	2,7593	2,51	2,526	0,3481	13,7	17	0	0	17
Cd	mg/kg	2R1			yes	0,016		0,017	0,016	0,01613	0,00051	3,2	15	1	0	16
	mg/kg	R1			yes			0,0020	0,00448	0,00568	0,00409	71,9	8	0	9	17
	mg/kg	R21			yes			0,0021	0,00472	0,00845	0,01217	144,	9	0	8	17
	mg/kg	R22			yes			0,0027	0,0068	0,00975	0,01189	121,	9	0	8	17
Cl	mg/kg	R1		1,359	yes	14300	10	15272	14300	14280	593	4,2	15	1	0	16
	mg/kg	R21		4,070	H	14100	20	19839	14000	14130	1033	7,3	15	1	0	16
	mg/kg	R22		0,295	yes	14500	20	14928	14170	14360	905	6,3	14	2	0	16
conductivity	mS/m	R1		-1,524	yes	2100	10	1940	2095	2095	86,51	4,1	16	1	0	17
	mS/m	R21		-1,028	yes	5740	20	5150	5750	5738	323,8	5,6	13	3	0	16
	mS/m	R22		0,069	yes	1450	20	1460	1435	1433	122,4	8,5	14	3	0	17
Cr	mg/kg	2R1		-0,373	yes	6,71	20	6,46	6,795	6,599	0,76	11,5	16	0	0	16
	mg/kg	R1		-0,412	yes	6,93	30	6,5020	6,968	6,848	1,21	17,6	17	0	0	17
	mg/kg	R21		2,310	yes	4,05	40	5,9212	4,3	4,059	1,049	25,8	17	0	0	17
	mg/kg	R22		-0,376	yes	5,49	30	5,1800	5,18	5,502	0,8711	15,8	17	0	0	17
Cu	mg/kg	R1			yes			0,0100	0,0356	0,06621	0,08269	124,	11	0	6	17
	mg/kg	R21			yes			0,0044	0,0142	0,0413	0,07963	192,	10	0	7	17
	mg/kg	R22			yes			0,0180	0,03	0,07255	0,0863	118,	11	0	6	17
DOC	mg/kg	R1			yes			29,6089	45,95	47,19	37,97	80,4	8	0	5	13
	mg/kg	R21			yes			8,7788	8,779	19,06	22,91	120,	9	0	4	13
	mg/kg	R22			yes			31,7735	31,77	54,98	72,57	131,	9	0	4	13
F	mg/kg	R1		0,346	yes	14,9	25	15,5447	16	14,88	2,404	16,1	11	4	2	17
	mg/kg	R21		-1,984	yes	4,31	40	2,6002	4,35	4,321	1,208	27,9	12	2	2	16
	mg/kg	R22		0,333	yes	13,8	40	14,7179	14,15	13,78	2,339	16,9	10	5	2	17
Mo	mg/kg	2R1		0,000	yes	5,74	10	5,74	5,745	5,73	0,1372	2,4	16	0	0	16
	mg/kg	R1		0,189	yes	6,42	30	6,6020	6,602	6,387	0,9057	14,1	17	0	0	17
	mg/kg	R21		2,245	yes	5,36	35	7,4658	5,51	5,274	1,357	25,7	17	0	0	17
	mg/kg	R22		0,257	yes	6,42	30	6,6679	6,515	6,383	0,9603	15,0	16	1	0	17
Ni	mg/kg	2R1			yes			0,018	0,0155	0,01725	0,00952	55,2	16	0	0	16
	mg/kg	R1			yes			0,0300	0,0099	0,03724	0,06586	176,	6	0	11	17
	mg/kg	R21			yes			0,0077	0,0023	0,00862	0,01159	134,	7	0	10	17
	mg/kg	R22			yes			0,0317	0,0119	0,04965	0,07216	145,	7	0	10	17
Pb	mg/kg	2R1		-0,489	yes	6,54	15	6,30	6,605	6,605	0,3396	5,1	14	2	0	16
	mg/kg	R1		0,664	yes	6,52	50	7,6023	6,615	6,554	1,491	22,7	16	1	0	17
	mg/kg	R21		1,669	yes	1,93	40	2,5744	1,76	1,632	0,8389	51,3	16	1	0	17
	mg/kg	R22		0,456	yes	5,53	30	5,9082	5,49	5,207	1,497	28,7	15	2	0	17
pH		R1		-0,610	yes	12,7	3,1	12,58	12,7	12,7	0,1673	1,3	18	0	0	18
		R21		-0,100	yes	12,9	3,1	12,88	12,88	12,86	0,1458	1,1	17	1	0	18
		R22		-0,254	yes	12,7	3,1	12,65	12,67	12,65	0,1661	1,3	17	1	0	18
Sb	mg/kg	R1			yes			0,0100	0,006	0,03287	0,05757	175,	4	0	13	17
	mg/kg	R21			yes			0,0026	0,00021	0,00196	0,00302	153,	5	0	12	17
	mg/kg	R22			yes			0,0106	0,00049	0,02866	0,05794	202,	5	0	12	17
Se	mg/kg	2R1		-2,133	yes	0,75	10	0,67	0,76	0,7482	0,02757	3,7	15	1	0	16
	mg/kg	R1		-1,874	yes	0,64	25	0,4901	0,66	0,6409	0,07771	12,1	16	1	0	17
	mg/kg	R21		0,108	yes	0,63	40	0,6436	0,6408	0,6019	0,1451	24,1	16	1	0	17
	mg/kg	R22		-1,094	yes	0,69	40	0,5390	0,6925	0,7006	0,1508	21,5	15	1	1	17
SO4	mg/kg	R1		0,210	yes	24800	20	25321	24650	24790	2474	10	16	0	0	16
	mg/kg	R21		2,723	H	20900	25	28014	20580	20530	2799	13,6	15	1	0	16
	mg/kg	R22		-0,171	yes	27600	20	27127	27150	27940	2524	9	15	1	0	16
V	mg/kg	2R1			yes			0,006	0,006	0,00673	0,00291	43,2	15	0	0	15
	mg/kg	R1			yes			0,0050	0,00382	0,00325	0,00173	53,1	6	0	10	16
	mg/kg	R21			yes			0,0026	0,00219	0,00188	0,00108	57,5	6	0	10	16
	mg/kg	R22			yes			0,0058	0,00487	0,00479	0,00327	68,4	6	0	10	16
Zn	mg/kg	2R1		1,226	yes	10,6	20	11,90	10,57	10,67	0,7406	6,9	15	1	0	16
	mg/kg	R1		0,280	yes	9,6	30	10,0030	10	9,543	1,503	15,7	17	0	0	17
	mg/kg	R21		0,872	yes	2,85	40	3,3468	2,92	2,517	0,8906	35,3	17	0	0	17
	mg/kg	R22		1,030	yes	9,35	30	10,7946	9,95	9,51	1,666	17,5	16	1	0	17

Outlier test failed: C - Cohcran, G1 - Grubbs(1-outlier algorithm), G2 - Grubbs(2-outliers algorithm), H - Hampel, M - manual

Analyte	Unit	Sample	z-Graphics -3 -2 -1 0 +1 +2 +3	Z- value	Outl test OK	Assig-ned value	2* Targ SD%	Lab's result	Md.	Mean	SD	SD%	Pas-sed	Outl. fai-led	Mis-sing	Num of labs
Laboratory 7																
As	mg/kg	R1			yes			0,00290	0,0075	0,01808	0,01984	109,	6	0	11	17
	mg/kg	R21			yes			0,00118	0,004	0,01078	0,01394	129,	7	0	10	17
	mg/kg	R22			yes			0,00301	0,01	0,04847	0,07201	148,	7	0	10	17
Ba	mg/kg	R1		1,160	yes	2,44	20	2,723	2,401	2,439	0,2026	8,3	15	2	0	17
	mg/kg	R21		1,066	yes	0,68	40	0,825	0,706	0,6694	0,1745	26,0	17	0	0	17
	mg/kg	R22		2,188	yes	2,56	20	3,120	2,51	2,526	0,3481	13,7	17	0	0	17
Cd	mg/kg	R1			yes			0,00874	0,00448	0,00568	0,00409	71,9	8	0	9	17
	mg/kg	R21			yes			0,00610	0,00472	0,00845	0,01217	144,	9	0	8	17
	mg/kg	R22			yes			0,00869	0,0068	0,00975	0,01189	121,	9	0	8	17
Cl	mg/kg	R1		-0,238	yes	14300	10	14129,7	14300	14280	593	4,2	15	1	0	16
	mg/kg	R21		-0,577	yes	14100	20	13286,2	14000	14130	1033	7,3	15	1	0	16
	mg/kg	R22		-0,436	yes	14500	20	13867,2	14170	14360	905	6,3	14	2	0	16
conductivity	mS/m	R1		-1,000	yes	2100	10	1995	2095	2095	86,51	4,1	16	1	0	17
	mS/m	R21		-0,645	yes	5740	20	5370	5750	5738	323,8	5,6	13	3	0	16
	mS/m	R22		-0,097	yes	1450	20	1436	1435	1433	122,4	8,5	14	3	0	17
Cr	mg/kg	R1		0,037	yes	6,93	30	6,968	6,968	6,848	1,21	17,6	17	0	0	17
	mg/kg	R21		0,321	yes	4,05	40	4,310	4,3	4,059	1,049	25,8	17	0	0	17
	mg/kg	R22		0,600	yes	5,49	30	5,984	5,18	5,502	0,8711	15,8	17	0	0	17
Cu	mg/kg	R1			yes			0,0356	0,0356	0,06621	0,08269	124,	11	0	6	17
	mg/kg	R21			yes			0,0174	0,0142	0,0413	0,07963	192,	10	0	7	17
	mg/kg	R22			yes			0,0291	0,03	0,07255	0,0863	118,	11	0	6	17
F	mg/kg	R1		-1,776	yes	14,9	25	11,592	16	14,88	2,404	16,1	11	4	2	17
	mg/kg	R21		-0,388	yes	4,31	40	3,976	4,35	4,321	1,208	27,9	12	2	2	16
	mg/kg	R22		-0,521	yes	13,8	40	12,362	14,15	13,78	2,339	16,9	10	5	2	17
Mo	mg/kg	R1		1,399	yes	6,42	30	7,767	6,602	6,387	0,9057	14,1	17	0	0	17
	mg/kg	R21		1,352	yes	5,36	35	6,628	5,51	5,274	1,357	25,7	17	0	0	17
	mg/kg	R22		1,747	yes	6,42	30	8,102	6,515	6,383	0,9603	15,0	16	1	0	17
Ni	mg/kg	R1			yes			0,00073	0,0099	0,03724	0,06586	176,	6	0	11	17
	mg/kg	R21			yes			0,00035	0,0023	0,00862	0,01159	134,	7	0	10	17
	mg/kg	R22			yes			0,00094	0,0119	0,04965	0,07216	145,	7	0	10	17
Pb	mg/kg	R1		-1,193	yes	6,52	50	4,575	6,615	6,554	1,491	22,7	16	1	0	17
	mg/kg	R21		-3,267	yes	1,93	40	0,669	1,76	1,632	0,8389	51,3	16	1	0	17
	mg/kg	R22		-2,392	yes	5,53	30	3,546	5,49	5,207	1,497	28,7	15	2	0	17
pH		R1		0,152	yes	12,7	3,1	12,73	12,7	12,7	0,1673	1,3	18	0	0	18
		R21		-0,150	yes	12,9	3,1	12,87	12,88	12,86	0,1458	1,1	17	1	0	18
		R22		-0,305	yes	12,7	3,1	12,64	12,67	12,65	0,1661	1,3	17	1	0	18
Sb	mg/kg	R1			yes			0,00046	0,006	0,03287	0,05757	175,	4	0	13	17
	mg/kg	R21			yes			0,00021	0,00021	0,00196	0,00302	153,	5	0	12	17
	mg/kg	R22			yes			0,00049	0,00049	0,02866	0,05794	202,	5	0	12	17
Se	mg/kg	R1		0,988	yes	0,64	25	0,719	0,66	0,6409	0,07771	12,1	16	1	0	17
	mg/kg	R21		1,071	yes	0,63	40	0,765	0,6408	0,6019	0,1451	24,1	16	1	0	17
	mg/kg	R22		0,870	yes	0,69	40	0,810	0,6925	0,7006	0,1508	21,5	15	1	1	17
SO4	mg/kg	R1		-2,105	yes	24800	20	19579,1	24650	24790	2474	10	16	0	0	16
	mg/kg	R21		-0,860	yes	20900	25	18653,8	20580	20530	2799	13,6	15	1	0	16
	mg/kg	R22		-0,661	yes	27600	20	25776,6	27150	27940	2524	9	15	1	0	16
V	mg/kg	R1			yes			0,00376	0,00382	0,00325	0,00173	53,1	6	0	10	16
	mg/kg	R21			yes			0,00133	0,00219	0,00188	0,00108	57,5	6	0	10	16
	mg/kg	R22			yes			0,00320	0,00487	0,00479	0,00327	68,4	6	0	10	16
Zn	mg/kg	R1		-0,651	yes	9,6	30	8,662	10	9,543	1,503	15,7	17	0	0	17
	mg/kg	R21		-0,967	yes	2,85	40	2,299	2,92	2,517	0,8906	35,3	17	0	0	17
	mg/kg	R22		-0,515	yes	9,35	30	8,628	9,95	9,51	1,666	17,5	16	1	0	17

Outlier test failed: C - Cohcran, G1 - Grubbs(1-outlier algorithm), G2 - Grubbs(2-outliers algorithm), H - Hampel, M - manual

Analyte	Unit	Sample	z-Graphics -3 -2 -1 0 +1 +2 +3	Z- value	Outl test OK	Assig-ned value	2* Targ SD%	Lab's result	Md.	Mean	SD	SD%	Pas-sed	Outl. fai-led	Mis-sing	Num of labs
Laboratory 8																
As	mg/kg	2R1			yes			0,032	0,008	0,01	0,00756	75,6	14	1	1	16
	mg/kg	R1						<0,50	0,0075	0,01808	0,01984	109,	6	0	11	17
	mg/kg	R21						<0,10	0,004	0,01078	0,01394	129,	7	0	10	17
	mg/kg	R22						<0,50	0,01	0,04847	0,07201	148,	7	0	10	17
Ba	mg/kg	2R1		-1,340	yes	2,09	15	1,88	2,04	2,072	0,1162	5,6	15	1	0	16
	mg/kg	R1		-1,393	yes	2,44	20	2,1	2,401	2,439	0,2026	8,3	15	2	0	17
	mg/kg	R21		0,147	yes	0,68	40	0,70	0,706	0,6694	0,1745	26,0	17	0	0	17
	mg/kg	R22		0,156	yes	2,56	20	2,6	2,51	2,526	0,3481	13,7	17	0	0	17
Cd	mg/kg	2R1			yes	0,016		0,017	0,016	0,01613	0,00051	3,2	15	1	0	16
	mg/kg	R1						<0,10	0,00448	0,00568	0,00409	71,9	8	0	9	17
	mg/kg	R21						<0,02	0,00472	0,00845	0,01217	144,	9	0	8	17
	mg/kg	R22						<0,10	0,0068	0,00975	0,01189	121,	9	0	8	17
Cl	mg/kg	R1		-2,343	yes	14300	10	12625	14300	14280	593	4,2	15	1	0	16
	mg/kg	R21		-0,072	yes	14100	20	13999	14000	14130	1033	7,3	15	1	0	16
	mg/kg	R22		5,212	H	14500	20	22058	14170	14360	905	6,3	14	2	0	16
conductivity	mS/m	R1		0,000	yes	2100	10	2100	2095	2095	86,51	4,1	16	1	0	17
	mS/m	R21		0,467	yes	5740	20	6008	5750	5738	323,8	5,6	13	3	0	16
	mS/m	R22		3,793	H	1450	20	2000	1435	1433	122,4	8,5	14	3	0	17
Cr	mg/kg	2R1		0,522	yes	6,71	20	7,06	6,795	6,599	0,76	11,5	16	0	0	16
	mg/kg	R1		0,837	yes	6,93	30	7,8	6,968	6,848	1,21	17,6	17	0	0	17
	mg/kg	R21		-0,556	yes	4,05	40	3,6	4,3	4,059	1,049	25,8	17	0	0	17
	mg/kg	R22		1,348	yes	5,49	30	6,6	5,18	5,502	0,8711	15,8	17	0	0	17
Cu	mg/kg	R1						<0,50	0,0356	0,06621	0,08269	124,	11	0	6	17
	mg/kg	R21						<0,10	0,0142	0,0413	0,07963	192,	10	0	7	17
	mg/kg	R22						<0,50	0,03	0,07255	0,0863	118,	11	0	6	17
F	mg/kg	R1			H	14,9	25	<20	16	14,88	2,404	16,1	11	4	2	17
	mg/kg	R21				4,31	40	<4,0	4,35	4,321	1,208	27,9	12	2	2	16
	mg/kg	R22			H	13,8	40	<28	14,15	13,78	2,339	16,9	10	5	2	17
Mo	mg/kg	2R1		0,592	yes	5,74	10	5,91	5,745	5,73	0,1372	2,4	16	0	0	16
	mg/kg	R1		0,685	yes	6,42	30	7,08	6,602	6,387	0,9057	14,1	17	0	0	17
	mg/kg	R21		0,256	yes	5,36	35	5,6	5,51	5,274	1,357	25,7	17	0	0	17
	mg/kg	R22		3,510	H	6,42	30	9,8	6,515	6,383	0,9603	15,0	16	1	0	17
Ni	mg/kg	2R1			yes			0,044	0,0155	0,01725	0,00952	55,2	16	0	0	16
	mg/kg	R1						<0,50	0,0099	0,03724	0,06586	176,	6	0	11	17
	mg/kg	R21						<0,10	0,0023	0,00862	0,01159	134,	7	0	10	17
	mg/kg	R22						<0,50	0,0119	0,04965	0,07216	145,	7	0	10	17
Pb	mg/kg	2R1		-6,667	H	6,54	15	3,27	6,605	6,605	0,3396	5,1	14	2	0	16
	mg/kg	R1		-1,853	yes	6,52	50	3,5	6,615	6,554	1,491	22,7	16	1	0	17
	mg/kg	R21		-2,409	yes	1,93	40	1,0	1,76	1,632	0,8389	51,3	16	1	0	17
	mg/kg	R22		-2,809	yes	5,53	30	3,2	5,49	5,207	1,497	28,7	15	2	0	17
pH		R1		2,388	yes	12,7	3,1	13,17	12,7	12,7	0,1673	1,3	18	0	0	18
		R21		2,201	H	12,9	3,1	13,34	12,88	12,86	0,1458	1,1	17	1	0	18
		R22		2,337	H	12,7	3,1	13,16	12,67	12,65	0,1661	1,3	17	1	0	18
Sb	mg/kg	R1						<0,50	0,006	0,03287	0,05757	175,	4	0	13	17
	mg/kg	R21						<0,10	0,00021	0,00196	0,00302	153,	5	0	12	17
	mg/kg	R22						<0,50	0,00049	0,02866	0,05794	202,	5	0	12	17
Se	mg/kg	2R1		0,000	yes	0,75	10	0,75	0,76	0,7482	0,02757	3,7	15	1	0	16
	mg/kg	R1		23,250	H	0,64	25	2,5	0,66	0,6409	0,07771	12,1	16	1	0	17
	mg/kg	R21		-0,238	yes	0,63	40	0,60	0,6408	0,6019	0,1451	24,1	16	1	0	17
	mg/kg	R22			H	0,69	40	<2,6	0,6925	0,7006	0,1508	21,5	15	1	1	17
SO4	mg/kg	R1		2,190	yes	24800	20	30230	24650	24790	2474	10	16	0	0	16
	mg/kg	R21		1,543	yes	20900	25	24930	20580	20530	2799	13,6	15	1	0	16
	mg/kg	R22		5,632	H	27600	20	43145	27150	27940	2524	9	15	1	0	16
V	mg/kg	2R1			yes			0,015	0,006	0,00673	0,00291	43,2	15	0	0	15
	mg/kg	R1						<0,50	0,00382	0,00325	0,00173	53,1	6	0	10	16
	mg/kg	R21						<0,10	0,00219	0,00188	0,00108	57,5	6	0	10	16
	mg/kg	R22						<0,50	0,00487	0,00479	0,00327	68,4	6	0	10	16
Zn	mg/kg	2R1		-1,189	yes	10,6	20	9,34	10,57	10,67	0,7406	6,9	15	1	0	16
	mg/kg	R1		-1,528	yes	9,6	30	7,4	10	9,543	1,503	15,7	17	0	0	17
	mg/kg	R21		-0,965	yes	2,85	40	2,3	2,92	2,517	0,8906	35,3	17	0	0	17
	mg/kg	R22		-0,178	yes	9,35	30	9,1	9,95	9,51	1,666	17,5	16	1	0	17

Outlier test failed: C - Cohcran, G1 - Grubbs(1-outlier algorithm), G2 - Grubbs(2-outliers algorithm), H - Hampel, M - manual

Analyte	Unit	Sample	z-Graphics -3 -2 -1 0 +1 +2 +3	Z- value	Outl test OK	Assig-ned value	2* Targ SD%	Lab's result	Md.	Mean	SD	SD%	Pas-sed	Outl. fai-led	Mis-sing	Num of labs
Laboratory 9																
As	mg/kg	R21			yes			0,03	0,004	0,01078	0,01394	129,	7	0	10	17
	mg/kg	R22			yes			0,2	0,01	0,04847	0,07201	148,	7	0	10	17
Ba	mg/kg	R21		0,147	yes	0,68	40	0,7	0,706	0,6694	0,1745	26,0	17	0	0	17
	mg/kg	R22		0,938	yes	2,56	20	2,8	2,51	2,526	0,3481	13,7	17	0	0	17
Cd	mg/kg	R21			yes			0,04	0,00472	0,00845	0,01217	144,	9	0	8	17
	mg/kg	R22			yes			0,04	0,0068	0,00975	0,01189	121,	9	0	8	17
Cl	mg/kg	R21		-0,682	yes	14100	20	13139	14000	14130	1033	7,3	15	1	0	16
	mg/kg	R22		-0,785	yes	14500	20	13361	14170	14360	905	6,3	14	2	0	16
conductivity	mS/m	R21		-9,895	H	5740	20	60,1	5750	5738	323,8	5,6	13	3	0	16
	mS/m	R22		-9,894	H	1450	20	15,3	1435	1433	122,4	8,5	14	3	0	17
Cr	mg/kg	R21		-1,296	yes	4,05	40	3,0	4,3	4,059	1,049	25,8	17	0	0	17
	mg/kg	R22		-1,445	yes	5,49	30	4,3	5,18	5,502	0,8711	15,8	17	0	0	17
Cu	mg/kg	R21			yes			0,03	0,0142	0,0413	0,07963	192,	10	0	7	17
	mg/kg	R22			yes			0,1	0,03	0,07255	0,0863	118,	11	0	6	17
DOC	mg/kg	R21			yes			2,7	8,779	19,06	22,91	120,	9	0	4	13
	mg/kg	R22			yes			6,2	31,77	54,98	72,57	131,	9	0	4	13
F	mg/kg	R21		-0,012	yes	4,31	40	4,3	4,35	4,321	1,208	27,9	12	2	2	16
	mg/kg	R22		-0,181	yes	13,8	40	13,3	14,15	13,78	2,339	16,9	10	5	2	17
Mo	mg/kg	R21		-0,810	yes	5,36	35	4,6	5,51	5,274	1,357	25,7	17	0	0	17
	mg/kg	R22		-0,644	yes	6,42	30	5,8	6,515	6,383	0,9603	15,0	16	1	0	17
Ni	mg/kg	R21			yes			0,03	0,0023	0,00862	0,01159	134,	7	0	10	17
	mg/kg	R22			yes			0,1	0,0119	0,04965	0,07216	145,	7	0	10	17
Pb	mg/kg	R21		0,440	yes	1,93	40	2,1	1,76	1,632	0,8389	51,3	16	1	0	17
	mg/kg	R22		0,808	yes	5,53	30	6,2	5,49	5,207	1,497	28,7	15	2	0	17
pH		R21		0,000	yes	12,9	3,1	12,9	12,88	12,86	0,1458	1,1	17	1	0	18
		R22		0,000	yes	12,7	3,1	12,7	12,67	12,65	0,1661	1,3	17	1	0	18
Sb	mg/kg	R21						<0,01	0,00021	0,00196	0,00302	153,	5	0	12	17
	mg/kg	R22						<0,05	0,00049	0,02866	0,05794	202,	5	0	12	17
Se	mg/kg	R21		3,730	H	0,63	40	1,1	0,6408	0,6019	0,1451	24,1	16	1	0	17
	mg/kg	R22		2,971	yes	0,69	40	1,1	0,6925	0,7006	0,1508	21,5	15	1	1	17
SO4	mg/kg	R21		-0,370	yes	20900	25	19932	20580	20530	2799	13,6	15	1	0	16
	mg/kg	R22		-0,894	yes	27600	20	25132	27150	27940	2524	9	15	1	0	16
V	mg/kg	R21						<0,02	0,00219	0,00188	0,00108	57,5	6	0	10	16
	mg/kg	R22						<0,1	0,00487	0,00479	0,00327	68,4	6	0	10	16
Zn	mg/kg	R21		0,789	yes	2,85	40	3,3	2,92	2,517	0,8906	35,3	17	0	0	17
	mg/kg	R22		1,818	yes	9,35	30	11,9	9,95	9,51	1,666	17,5	16	1	0	17
Laboratory 10																
As	mg/kg	2R1			yes			0,008	0,008	0,01	0,00756	75,6	14	1	1	16
	mg/kg	R1			yes			0,01	0,0075	0,01808	0,01984	109,	6	0	11	17
	mg/kg	R21			yes			0,004	0,004	0,01078	0,01394	129,	7	0	10	17
	mg/kg	R22			yes			0,01	0,01	0,04847	0,07201	148,	7	0	10	17
Ba	mg/kg	2R1		0,574	yes	2,09	15	2,18	2,04	2,072	0,1162	5,6	15	1	0	16
	mg/kg	R1		-0,738	yes	2,44	20	2,26	2,401	2,439	0,2026	8,3	15	2	0	17
	mg/kg	R21		-0,368	yes	0,68	40	0,63	0,706	0,6694	0,1745	26,0	17	0	0	17
	mg/kg	R22		-0,625	yes	2,56	20	2,4	2,51	2,526	0,3481	13,7	17	0	0	17
Cd	mg/kg	2R1			H	0,016		0,013	0,016	0,01613	0,00051	3,2	15	1	0	16
	mg/kg	R1			yes			0,01	0,00448	0,00568	0,00409	71,9	8	0	9	17
	mg/kg	R21			yes			0,008	0,00472	0,00845	0,01217	144,	9	0	8	17
	mg/kg	R22			yes			0,01	0,0068	0,00975	0,01189	121,	9	0	8	17
Cl	mg/kg	R1		-0,141	yes	14300	10	14199	14300	14280	593	4,2	15	1	0	16
	mg/kg	R21		-0,223	yes	14100	20	13785	14000	14130	1033	7,3	15	1	0	16
	mg/kg	R22		-0,564	yes	14500	20	13682	14170	14360	905	6,3	14	2	0	16
conductivity	mS/m	R1		-0,238	yes	2100	10	2075	2095	2095	86,51	4,1	16	1	0	17
	mS/m	R21		-0,244	yes	5740	20	5600	5750	5738	323,8	5,6	13	3	0	16
	mS/m	R22		-0,117	yes	1450	20	1433	1435	1433	122,4	8,5	14	3	0	17
Cr	mg/kg	2R1		0,477	yes	6,71	20	7,03	6,795	6,599	0,76	11,5	16	0	0	16
	mg/kg	R1		0,192	yes	6,93	30	7,13	6,968	6,848	1,21	17,6	17	0	0	17
	mg/kg	R21		-0,370	yes	4,05	40	3,75	4,3	4,059	1,049	25,8	17	0	0	17
	mg/kg	R22		-0,461	yes	5,49	30	5,11	5,18	5,502	0,8711	15,8	17	0	0	17
Cu	mg/kg	R1						<0,05	0,0356	0,06621	0,08269	124,	11	0	6	17
	mg/kg	R21						<0,01	0,0142	0,0413	0,07963	192,	10	0	7	17
	mg/kg	R22						<0,05	0,03	0,07255	0,0863	118,	11	0	6	17
DOC	mg/kg	R1						<5	45,95	47,19	37,97	80,4	8	0	5	13
	mg/kg	R21			yes			2,8	8,779	19,06	22,91	120,	9	0	4	13
	mg/kg	R22			yes			5,3	31,77	54,98	72,57	131,	9	0	4	13
F	mg/kg	R1		11,170	H	14,9	25	35,7	16	14,88	2,404	16,1	11	4	2	17
	mg/kg	R21		2,587	yes	4,31	40	6,54	4,35	4,321	1,208	27,9	12	2	2	16

Outlier test failed: C - Cohcran, G1 - Grubbs(1-outlier algorithm), G2 - Grubbs(2-outliers algorithm), H - Hampel, M - manual

Analyte	Unit	Sample	z-Graphics -3 -2 -1 0 +1 +2 +3	Z- value	Outl test OK	Assig-ned value	2* Targ SD%	Lab's result	Md.	Mean	SD	SD%	Pas-sed	Outl. fai-led	Mis-sing	Num of labs
	mg/kg	R22		32,320	H	13,8	40	103	14,15	13,78	2,339	16,9	10	5	2	17
Laboratory 10																
Mo	mg/kg	2R1		-0,174	yes	5,74	10	5,69	5,745	5,73	0,1372	2,4	16	0	0	16
	mg/kg	R1		-0,654	yes	6,42	30	5,79	6,602	6,387	0,9057	14,1	17	0	0	17
	mg/kg	R21		-0,789	yes	5,36	35	4,62	5,51	5,274	1,357	25,7	17	0	0	17
	mg/kg	R22		-0,083	yes	6,42	30	6,34	6,515	6,383	0,9603	15,0	16	1	0	17
Ni	mg/kg	2R1			yes			0,011	0,0155	0,01725	0,00952	55,2	16	0	0	16
	mg/kg	R1			yes			0,01	0,0099	0,03724	0,06586	176,	6	0	11	17
	mg/kg	R21			yes			0,001	0,0023	0,00862	0,01159	134,	7	0	10	17
	mg/kg	R22			yes			0,01	0,0119	0,04965	0,07216	145,	7	0	10	17
Pb	mg/kg	2R1		0,245	yes	6,54	15	6,66	6,605	6,605	0,3396	5,1	14	2	0	16
	mg/kg	R1		0,049	yes	6,52	50	6,60	6,615	6,554	1,491	22,7	16	1	0	17
	mg/kg	R21		0,389	yes	1,93	40	2,08	1,76	1,632	0,8389	51,3	16	1	0	17
	mg/kg	R22		0,711	yes	5,53	30	6,12	5,49	5,207	1,497	28,7	15	2	0	17
pH		R1		0,203	yes	12,7	3,1	12,74	12,7	12,7	0,1673	1,3	18	0	0	18
		R21		0,050	yes	12,9	3,1	12,91	12,88	12,86	0,1458	1,1	17	1	0	18
		R22		-0,051	yes	12,7	3,1	12,69	12,67	12,65	0,1661	1,3	17	1	0	18
Sb	mg/kg	R1						<0,01	0,006	0,03287	0,05757	175,	4	0	13	17
	mg/kg	R21						<0,001	0,00021	0,00196	0,00302	153,	5	0	12	17
	mg/kg	R22						<0,01	0,00049	0,02866	0,05794	202,	5	0	12	17
Se	mg/kg	2R1		-1,067	yes	0,75	10	0,71	0,76	0,7482	0,02757	3,7	15	1	0	16
	mg/kg	R1		1,125	yes	0,64	25	0,73	0,66	0,6409	0,07771	12,1	16	1	0	17
	mg/kg	R21		1,349	yes	0,63	40	0,80	0,6408	0,6019	0,1451	24,1	16	1	0	17
	mg/kg	R22		0,870	yes	0,69	40	0,81	0,6925	0,7006	0,1508	21,5	15	1	1	17
SO4	mg/kg	R1		0,069	yes	24800	20	24970	24650	24790	2474	10	16	0	0	16
	mg/kg	R21		-0,124	yes	20900	25	20575	20580	20530	2799	13,6	15	1	0	16
	mg/kg	R22		0,051	yes	27600	20	27741	27150	27940	2524	9	15	1	0	16
V	mg/kg	2R1			yes			0,006	0,006	0,00673	0,00291	43,2	15	0	0	15
	mg/kg	R1			yes			0,004	0,00382	0,00325	0,00173	53,1	6	0	10	16
	mg/kg	R21			yes			0,003	0,00219	0,00188	0,00108	57,5	6	0	10	16
	mg/kg	R22			yes			0,01	0,00487	0,00479	0,00327	68,4	6	0	10	16
Zn	mg/kg	2R1		-0,283	yes	10,6	20	10,30	10,57	10,67	0,7406	6,9	15	1	0	16
	mg/kg	R1		0,347	yes	9,6	30	10,1	10	9,543	1,503	15,7	17	0	0	17
	mg/kg	R21		0,456	yes	2,85	40	3,11	2,92	2,517	0,8906	35,3	17	0	0	17
	mg/kg	R22		0,749	yes	9,35	30	10,4	9,95	9,51	1,666	17,5	16	1	0	17
Laboratory 11																
As	mg/kg	2R1			yes			0,005	0,008	0,01	0,00756	75,6	14	1	1	16
	mg/kg	R1						<0,01	0,0075	0,01808	0,01984	109,	6	0	11	17
	mg/kg	R21						<0,01	0,004	0,01078	0,01394	129,	7	0	10	17
	mg/kg	R22						<0,01	0,01	0,04847	0,07201	148,	7	0	10	17
Ba	mg/kg	2R1		-0,319	yes	2,09	15	2,04	2,04	2,072	0,1162	5,6	15	1	0	16
	mg/kg	R1		0,451	yes	2,44	20	2,55	2,401	2,439	0,2026	8,3	15	2	0	17
	mg/kg	R21		0,588	yes	0,68	40	0,760	0,706	0,6694	0,1745	26,0	17	0	0	17
	mg/kg	R22		1,094	yes	2,56	20	2,84	2,51	2,526	0,3481	13,7	17	0	0	17
Cd	mg/kg	2R1			yes	0,016		0,016	0,016	0,01613	0,00051	3,2	15	1	0	16
	mg/kg	R1						<0,01	0,00448	0,00568	0,00409	71,9	8	0	9	17
	mg/kg	R21						<0,01	0,00472	0,00845	0,01217	144,	9	0	8	17
	mg/kg	R22						<0,01	0,0068	0,00975	0,01189	121,	9	0	8	17
Cl	mg/kg	R1		-0,420	yes	14300	10	14000	14300	14280	593	4,2	15	1	0	16
	mg/kg	R21		-0,567	yes	14100	20	13300	14000	14130	1033	7,3	15	1	0	16
	mg/kg	R22		-0,138	yes	14500	20	14300	14170	14360	905	6,3	14	2	0	16
conductivity	mS/m	R1		-0,095	yes	2100	10	2090	2095	2095	86,51	4,1	16	1	0	17
	mS/m	R21		0,192	yes	5740	20	5850	5750	5738	323,8	5,6	13	3	0	16
	mS/m	R22		0,552	yes	1450	20	1530	1435	1433	122,4	8,5	14	3	0	17
Cr	mg/kg	2R1		0,224	yes	6,71	20	6,86	6,795	6,599	0,76	11,5	16	0	0	16
	mg/kg	R1		0,019	yes	6,93	30	6,95	6,968	6,848	1,21	17,6	17	0	0	17
	mg/kg	R21		0,395	yes	4,05	40	4,37	4,3	4,059	1,049	25,8	17	0	0	17
	mg/kg	R22		0,704	yes	5,49	30	6,07	5,18	5,502	0,8711	15,8	17	0	0	17
Cu	mg/kg	R1			yes			0,292	0,0356	0,06621	0,08269	124,	11	0	6	17
	mg/kg	R21			yes			0,262	0,0142	0,0413	0,07963	192,	10	0	7	17
	mg/kg	R22			yes			0,298	0,03	0,07255	0,0863	118,	11	0	6	17
DOC	mg/kg	R1						<10	45,95	47,19	37,97	80,4	8	0	5	13
	mg/kg	R21						<10	8,779	19,06	22,91	120,	9	0	4	13
	mg/kg	R22						<50	31,77	54,98	72,57	131,	9	0	4	13
F	mg/kg	R1		-0,483	yes	14,9	25	14,0	16	14,88	2,404	16,1	11	4	2	17
	mg/kg	R21		-0,302	yes	4,31	40	4,05	4,35	4,321	1,208	27,9	12	2	2	16
	mg/kg	R22		0,181	yes	13,8	40	14,3	14,15	13,78	2,339	16,9	10	5	2	17
Mo	mg/kg	2R1		0,418	yes	5,74	10	5,86	5,745	5,73	0,1372	2,4	16	0	0	16

Analyte	Unit	Sample	z-Graphics -3 -2 -1 0 +1 +2 +3	Z- value	Outl test OK	Assig-ned value	2* Targ SD%	Lab's result	Md.	Mean	SD	SD%	Pas-sed	Outl. fai-led	Mis-sing	Num of labs
	mg/kg	R1		-0,135	yes	6,42	30	6,29	6,602	6,387	0,9057	14,1	17	0	0	17
Laboratory 11																
Mo	mg/kg	R21		-0,298	yes	5,36	35	5,08	5,51	5,274	1,357	25,7	17	0	0	17
	mg/kg	R22		-0,135	yes	6,42	30	6,29	6,515	6,383	0,9603	15,0	16	1	0	17
Ni	mg/kg	2R1			yes			0,013	0,0155	0,01725	0,00952	55,2	16	0	0	16
	mg/kg	R1			yes			0,170	0,0099	0,03724	0,06586	176,	6	0	11	17
	mg/kg	R21			yes			0,019	0,0023	0,00862	0,01159	134,	7	0	10	17
	mg/kg	R22			yes			0,193	0,0119	0,04965	0,07216	145,	7	0	10	17
Pb	mg/kg	2R1		-0,652	yes	6,54	15	6,22	6,605	6,605	0,3396	5,1	14	2	0	16
	mg/kg	R1		-0,466	yes	6,52	50	5,76	6,615	6,554	1,491	22,7	16	1	0	17
	mg/kg	R21		-1,399	yes	1,93	40	1,39	1,76	1,632	0,8389	51,3	16	1	0	17
	mg/kg	R22		-0,072	yes	5,53	30	5,47	5,49	5,207	1,497	28,7	15	2	0	17
pH		R1		-0,508	yes	12,7	3,1	12,6	12,7	12,7	0,1673	1,3	18	0	0	18
		R21		0,000	yes	12,9	3,1	12,9	12,88	12,86	0,1458	1,1	17	1	0	18
		R22		-0,508	yes	12,7	3,1	12,6	12,67	12,65	0,1661	1,3	17	1	0	18
Sb	mg/kg	R1						<0,01	0,006	0,03287	0,05757	175,	4	0	13	17
	mg/kg	R21						<0,01	0,00021	0,00196	0,00302	153,	5	0	12	17
	mg/kg	R22						<0,01	0,00049	0,02866	0,05794	202,	5	0	12	17
Se	mg/kg	2R1		0,267	yes	0,75	10	0,76	0,76	0,7482	0,02757	3,7	15	1	0	16
	mg/kg	R1		0,250	yes	0,64	25	0,660	0,66	0,6409	0,07771	12,1	16	1	0	17
	mg/kg	R21		0,063	yes	0,63	40	0,638	0,6408	0,6019	0,1451	24,1	16	1	0	17
	mg/kg	R22		-0,145	yes	0,69	40	0,670	0,6925	0,7006	0,1508	21,5	15	1	1	17
SO4	mg/kg	R1		-0,887	yes	24800	20	22600	24650	24790	2474	10	16	0	0	16
	mg/kg	R21		-0,766	yes	20900	25	18900	20580	20530	2799	13,6	15	1	0	16
	mg/kg	R22		-0,652	yes	27600	20	25800	27150	27940	2524	9	15	1	0	16
V	mg/kg	2R1			yes			0,006	0,006	0,00673	0,00291	43,2	15	0	0	15
	mg/kg	R1						<0,01	0,00382	0,00325	0,00173	53,1	6	0	10	16
	mg/kg	R21						<0,01	0,00219	0,00188	0,00108	57,5	6	0	10	16
	mg/kg	R22						<0,01	0,00487	0,00479	0,00327	68,4	6	0	10	16
Zn	mg/kg	2R1		-0,189	yes	10,6	20	10,40	10,57	10,67	0,7406	6,9	15	1	0	16
	mg/kg	R1		-0,506	yes	9,6	30	8,872	10	9,543	1,503	15,7	17	0	0	17
	mg/kg	R21		-3,109	yes	2,85	40	1,078	2,92	2,517	0,8906	35,3	17	0	0	17
	mg/kg	R22		-0,250	yes	9,35	30	9,00	9,95	9,51	1,666	17,5	16	1	0	17
Laboratory 12																
As	mg/kg	2R1			yes			0,017	0,008	0,01	0,00756	75,6	14	1	1	16
	mg/kg	R1						<0,020	0,0075	0,01808	0,01984	109,	6	0	11	17
	mg/kg	R21						<0,020	0,004	0,01078	0,01394	129,	7	0	10	17
	mg/kg	R22						<0,020	0,01	0,04847	0,07201	148,	7	0	10	17
Ba	mg/kg	2R1		-0,574	yes	2,09	15	2,00	2,04	2,072	0,1162	5,6	15	1	0	16
	mg/kg	R1		0,410	yes	2,44	20	2,54	2,401	2,439	0,2026	8,3	15	2	0	17
	mg/kg	R21		0,588	yes	0,68	40	0,760	0,706	0,6694	0,1745	26,0	17	0	0	17
	mg/kg	R22		0,195	yes	2,56	20	2,61	2,51	2,526	0,3481	13,7	17	0	0	17
Cd	mg/kg	2R1			yes	0,016		0,016	0,016	0,01613	0,00051	3,2	15	1	0	16
	mg/kg	R1						<0,020	0,00448	0,00568	0,00409	71,9	8	0	9	17
	mg/kg	R21						<0,020	0,00472	0,00845	0,01217	144,	9	0	8	17
	mg/kg	R22						<0,020	0,0068	0,00975	0,01189	121,	9	0	8	17
Cl	mg/kg	R1		0,559	yes	14300	10	14700	14300	14280	593	4,2	15	1	0	16
	mg/kg	R21		0,213	yes	14100	20	14400	14000	14130	1033	7,3	15	1	0	16
	mg/kg	R22		-0,138	yes	14500	20	14300	14170	14360	905	6,3	14	2	0	16
conductivity	mS/m	R1		0,095	yes	2100	10	2110	2095	2095	86,51	4,1	16	1	0	17
	mS/m	R21		-0,035	yes	5740	20	5720	5750	5738	323,8	5,6	13	3	0	16
	mS/m	R22		-0,434	yes	1450	20	1387	1435	1433	122,4	8,5	14	3	0	17
Cr	mg/kg	2R1		-0,522	yes	6,71	20	6,36	6,795	6,599	0,76	11,5	16	0	0	16
	mg/kg	R1		0,741	yes	6,93	30	7,70	6,968	6,848	1,21	17,6	17	0	0	17
	mg/kg	R21		0,864	yes	4,05	40	4,75	4,3	4,059	1,049	25,8	17	0	0	17
	mg/kg	R22		0,437	yes	5,49	30	5,85	5,18	5,502	0,8711	15,8	17	0	0	17
Cu	mg/kg	R1			yes			0,023	0,0356	0,06621	0,08269	124,	11	0	6	17
	mg/kg	R21						<0,020	0,0142	0,0413	0,07963	192,	10	0	7	17
	mg/kg	R22			yes			0,024	0,03	0,07255	0,0863	118,	11	0	6	17
DOC	mg/kg	R1						<10	45,95	47,19	37,97	80,4	8	0	5	13
	mg/kg	R21			yes			3,04	8,779	19,06	22,91	120,	9	0	4	13
	mg/kg	R22						<10	31,77	54,98	72,57	131,	9	0	4	13
F	mg/kg	R1		0,698	yes	14,9	25	16,2	16	14,88	2,404	16,1	11	4	2	17
	mg/kg	R21		0,522	yes	4,31	40	4,76	4,35	4,321	1,208	27,9	12	2	2	16
	mg/kg	R22		-0,471	yes	13,8	40	12,5	14,15	13,78	2,339	16,9	10	5	2	17
Mo	mg/kg	2R1		-0,488	yes	5,74	10	5,60	5,745	5,73	0,1372	2,4	16	0	0	16
	mg/kg	R1		0,488	yes	6,42	30	6,89	6,602	6,387	0,9057	14,1	17	0	0	17
	mg/kg	R21		0,160	yes	5,36	35	5,51	5,51	5,274	1,357	25,7	17	0	0	17

Analyte	Unit	Sample	z-Graphics -3 -2 -1 0 +1 +2 +3	Z- value	Outl test OK	Assig-ned value	2* Targ SD%	Lab's result	Md.	Mean	SD	SD%	Pas-sed	Outl. fai-led	Mis-sing	Num of labs
	mg/kg	R22		0,114	yes	6,42	30	6,53	6,515	6,383	0,9603	15,0	16	1	0	17
Laboratory 12																
Ni	mg/kg	2R1			yes			0,022	0,0155	0,01725	0,00952	55,2	16	0	0	16
	mg/kg	R1						<0,020	0,0099	0,03724	0,06586	176,	6	0	11	17
	mg/kg	R21						<0,020	0,0023	0,00862	0,01159	134,	7	0	10	17
	mg/kg	R22						<0,020	0,0119	0,04965	0,07216	145,	7	0	10	17
Pb	mg/kg	2R1		0,306	yes	6,54	15	6,69	6,605	6,605	0,3396	5,1	14	2	0	16
	mg/kg	R1		0,865	yes	6,52	50	7,93	6,615	6,554	1,491	22,7	16	1	0	17
	mg/kg	R21		1,632	yes	1,93	40	2,56	1,76	1,632	0,8389	51,3	16	1	0	17
	mg/kg	R22		1,579	yes	5,53	30	6,84	5,49	5,207	1,497	28,7	15	2	0	17
pH		R1		0,457	yes	12,7	3,1	12,79	12,7	12,7	0,1673	1,3	18	0	0	18
		R21		-0,150	yes	12,9	3,1	12,87	12,88	12,86	0,1458	1,1	17	1	0	18
		R22		-0,152	yes	12,7	3,1	12,67	12,67	12,65	0,1661	1,3	17	1	0	18
Sb	mg/kg	R1						<0,020	0,006	0,03287	0,05757	175,	4	0	13	17
	mg/kg	R21						<0,020	0,00021	0,00196	0,00302	153,	5	0	12	17
	mg/kg	R22						<0,020	0,00049	0,02866	0,05794	202,	5	0	12	17
Se	mg/kg	2R1		0,000	yes	0,75	10	0,75	0,76	0,7482	0,02757	3,7	15	1	0	16
	mg/kg	R1		0,662	yes	0,64	25	0,693	0,66	0,6409	0,07771	12,1	16	1	0	17
	mg/kg	R21		0,111	yes	0,63	40	0,644	0,6408	0,6019	0,1451	24,1	16	1	0	17
	mg/kg	R22		-0,036	yes	0,69	40	0,685	0,6925	0,7006	0,1508	21,5	15	1	1	17
SO4	mg/kg	R1		-0,363	yes	24800	20	23900	24650	24790	2474	10	16	0	0	16
	mg/kg	R21		-0,077	yes	20900	25	20700	20580	20530	2799	13,6	15	1	0	16
	mg/kg	R22		-0,326	yes	27600	20	26700	27150	27940	2524	9	15	1	0	16
V	mg/kg	2R1			yes			0,010	0,006	0,00673	0,00291	43,2	15	0	0	15
	mg/kg	R1						<0,020	0,00382	0,00325	0,00173	53,1	6	0	10	16
	mg/kg	R21						<0,020	0,00219	0,00188	0,00108	57,5	6	0	10	16
	mg/kg	R22						<0,020	0,00487	0,00479	0,00327	68,4	6	0	10	16
Zn	mg/kg	2R1		0,160	yes	10,6	20	10,77	10,57	10,67	0,7406	6,9	15	1	0	16
	mg/kg	R1		0,486	yes	9,6	30	10,3	10	9,543	1,503	15,7	17	0	0	17
	mg/kg	R21		1,018	yes	2,85	40	3,43	2,92	2,517	0,8906	35,3	17	0	0	17
	mg/kg	R22		0,891	yes	9,35	30	10,6	9,95	9,51	1,666	17,5	16	1	0	17
Laboratory 13																
As	mg/kg	2R1			yes			0,006	0,008	0,01	0,00756	75,6	14	1	1	16
	mg/kg	R1			yes			0,0039	0,0075	0,01808	0,01984	109,	6	0	11	17
	mg/kg	R21			yes			0,00	0,004	0,01078	0,01394	129,	7	0	10	17
	mg/kg	R22			yes			0,00	0,01	0,04847	0,07201	148,	7	0	10	17
Ba	mg/kg	2R1		3,892	H	2,09	15	2,70	2,04	2,072	0,1162	5,6	15	1	0	16
	mg/kg	R1		7,316	H	2,44	20	4,225	2,401	2,439	0,2026	8,3	15	2	0	17
	mg/kg	R21		-2,574	yes	0,68	40	0,33	0,706	0,6694	0,1745	26,0	17	0	0	17
	mg/kg	R22		-2,930	yes	2,56	20	1,81	2,51	2,526	0,3481	13,7	17	0	0	17
Cd	mg/kg	2R1			yes	0,016		0,016	0,016	0,01613	0,00051	3,2	15	1	0	16
	mg/kg	R1			yes			0,0118	0,00448	0,00568	0,00409	71,9	8	0	9	17
	mg/kg	R21			yes			0,009	0,00472	0,00845	0,01217	144,	9	0	8	17
	mg/kg	R22			yes			0,011	0,0068	0,00975	0,01189	121,	9	0	8	17
Cl	mg/kg	R1		0,098	yes	14300	10	14370	14300	14280	593	4,2	15	1	0	16
	mg/kg	R21		0,376	yes	14100	20	14630	14000	14130	1033	7,3	15	1	0	16
	mg/kg	R22		0,166	yes	14500	20	14740	14170	14360	905	6,3	14	2	0	16
conductivity	mS/m	R1		1,496	yes	2100	10	2257,10	2095	2095	86,51	4,1	16	1	0	17
	mS/m	R21		0,017	yes	5740	20	5750	5750	5738	323,8	5,6	13	3	0	16
	mS/m	R22		1,146	yes	1450	20	1616,21	1435	1433	122,4	8,5	14	3	0	17
Cr	mg/kg	2R1		-2,012	yes	6,71	20	5,36	6,795	6,599	0,76	11,5	16	0	0	16
	mg/kg	R1		-1,213	yes	6,93	30	5,6691	6,968	6,848	1,21	17,6	17	0	0	17
	mg/kg	R21		-0,481	yes	4,05	40	3,66	4,3	4,059	1,049	25,8	17	0	0	17
	mg/kg	R22		-0,753	yes	5,49	30	4,87	5,18	5,502	0,8711	15,8	17	0	0	17
Cu	mg/kg	R1			yes			0,0216	0,0356	0,06621	0,08269	124,	11	0	6	17
	mg/kg	R21			yes			0,00	0,0142	0,0413	0,07963	192,	10	0	7	17
	mg/kg	R22			yes			0,02	0,03	0,07255	0,0863	118,	11	0	6	17
DOC	mg/kg	R1			yes			51,422	45,95	47,19	37,97	80,4	8	0	5	13
	mg/kg	R21			yes			18	8,779	19,06	22,91	120,	9	0	4	13
	mg/kg	R22			yes			24	31,77	54,98	72,57	131,	9	0	4	13
F	mg/kg	R1		-2,334	yes	14,9	25	10,553	16	14,88	2,404	16,1	11	4	2	17
	mg/kg	R21		-5,000	M	4,31	40	0,0	4,35	4,321	1,208	27,9	12	2	2	16
	mg/kg	R22		-5,000	H	13,8	40	0,0	14,15	13,78	2,339	16,9	10	5	2	17
Mo	mg/kg	2R1		-1,220	yes	5,74	10	5,39	5,745	5,73	0,1372	2,4	16	0	0	16
	mg/kg	R1		1,098	yes	6,42	30	7,4778	6,602	6,387	0,9057	14,1	17	0	0	17
	mg/kg	R21		0,938	yes	5,36	35	6,24	5,51	5,274	1,357	25,7	17	0	0	17
	mg/kg	R22		0,530	yes	6,42	30	6,93	6,515	6,383	0,9603	15,0	16	1	0	17
Ni	mg/kg	2R1			yes			0,018	0,0155	0,01725	0,00952	55,2	16	0	0	16

Outlier test failed: C - Cohcran, G1 - Grubbs(1-outlier algorithm), G2 - Grubbs(2-outliers algorithm), H - Hampel, M - manual

Analyte	Unit	Sample	z-Graphics -3 -2 -1 0 +1 +2 +3	Z- value	Outl test OK	Assig-ned value	2* Targ SD%	Lab's result	Md.	Mean	SD	SD%	Pas-sed	Outl. fai-led	Mis-sing	Num of labs
	mg/kg	R1			yes			0,0029	0,0099	0,03724	0,06586	176,	6	0	11	17
Laboratory 13																
Ni	mg/kg	R21			yes			0,00	0,0023	0,00862	0,01159	134,	7	0	10	17
	mg/kg	R22			yes			0,00	0,0119	0,04965	0,07216	145,	7	0	10	17
Pb	mg/kg	2R1		1,876	yes	6,54	15	7,46	6,605	6,605	0,3396	5,1	14	2	0	16
	mg/kg	R1		2,182	yes	6,52	50	10,0759	6,615	6,554	1,491	22,7	16	1	0	17
	mg/kg	R21		-1,684	yes	1,93	40	1,28	1,76	1,632	0,8389	51,3	16	1	0	17
	mg/kg	R22		-0,048	yes	5,53	30	5,49	5,49	5,207	1,497	28,7	15	2	0	17
pH		R1		-0,660	yes	12,7	3,1	12,57	12,7	12,7	0,1673	1,3	18	0	0	18
		R21		-0,400	yes	12,9	3,1	12,82	12,88	12,86	0,1458	1,1	17	1	0	18
		R22		-0,457	yes	12,7	3,1	12,61	12,67	12,65	0,1661	1,3	17	1	0	18
Sb	mg/kg	R1			yes			0,0020	0,006	0,03287	0,05757	175,	4	0	13	17
	mg/kg	R21			yes			0,00	0,00021	0,00196	0,00302	153,	5	0	12	17
	mg/kg	R22			yes			0,00	0,00049	0,02866	0,05794	202,	5	0	12	17
Se	mg/kg	2R1		-2,667	H	0,75	10	0,65	0,76	0,7482	0,02757	3,7	15	1	0	16
	mg/kg	R1		-1,487	yes	0,64	25	0,5210	0,66	0,6409	0,07771	12,1	16	1	0	17
	mg/kg	R21		-2,778	yes	0,63	40	0,28	0,6408	0,6019	0,1451	24,1	16	1	0	17
	mg/kg	R22		-1,377	yes	0,69	40	0,50	0,6925	0,7006	0,1508	21,5	15	1	1	17
SO4	mg/kg	R1		1,202	yes	24800	20	27780	24650	24790	2474	10	16	0	0	16
	mg/kg	R21		0,008	yes	20900	25	20920	20580	20530	2799	13,6	15	1	0	16
	mg/kg	R22		-0,163	yes	27600	20	27150	27150	27940	2524	9	15	1	0	16
V	mg/kg	2R1			yes			0,005	0,006	0,00673	0,00291	43,2	15	0	0	15
	mg/kg	R1			yes			0,0029	0,00382	0,00325	0,00173	53,1	6	0	10	16
	mg/kg	R21			yes			0,002	0,00219	0,00188	0,00108	57,5	6	0	10	16
	mg/kg	R22			yes			0,005	0,00487	0,00479	0,00327	68,4	6	0	10	16
Zn	mg/kg	2R1		0,660	yes	10,6	20	11,30	10,57	10,67	0,7406	6,9	15	1	0	16
	mg/kg	R1		-0,131	yes	9,6	30	9,4114	10	9,543	1,503	15,7	17	0	0	17
	mg/kg	R21		-3,632	yes	2,85	40	0,78	2,92	2,517	0,8906	35,3	17	0	0	17
	mg/kg	R22		-2,367	yes	9,35	30	6,03	9,95	9,51	1,666	17,5	16	1	0	17
Laboratory 14																
As	mg/kg	2R1			yes			0,006	0,008	0,01	0,00756	75,6	14	1	1	16
	mg/kg	R1			yes			0,040	0,0075	0,01808	0,01984	109,	6	0	11	17
	mg/kg	R21			yes			0,032	0,004	0,01078	0,01394	129,	7	0	10	17
	mg/kg	R22			yes			0,069	0,01	0,04847	0,07201	148,	7	0	10	17
Ba	mg/kg	2R1		0,064	yes	2,09	15	2,10	2,04	2,072	0,1162	5,6	15	1	0	16
	mg/kg	R1		-3,648	H	2,44	20	1,55	2,401	2,439	0,2026	8,3	15	2	0	17
	mg/kg	R21		-2,279	yes	0,68	40	0,37	0,706	0,6694	0,1745	26,0	17	0	0	17
	mg/kg	R22		-3,086	yes	2,56	20	1,77	2,51	2,526	0,3481	13,7	17	0	0	17
Cd	mg/kg	2R1			yes	0,016		0,016	0,016	0,01613	0,00051	3,2	15	1	0	16
	mg/kg	R1						<0,005	0,00448	0,00568	0,00409	71,9	8	0	9	17
	mg/kg	R21						<0,005	0,00472	0,00845	0,01217	144,	9	0	8	17
	mg/kg	R22						<0,005	0,0068	0,00975	0,01189	121,	9	0	8	17
conductivity	mS/m	R1		0,857	yes	2100	10	2190	2095	2095	86,51	4,1	16	1	0	17
	mS/m	R22		1,103	yes	1450	20	1610	1435	1433	122,4	8,5	14	3	0	17
Cr	mg/kg	2R1		-3,249	yes	6,71	20	4,53	6,795	6,599	0,76	11,5	16	0	0	16
	mg/kg	R1		-3,203	yes	6,93	30	3,60	6,968	6,848	1,21	17,6	17	0	0	17
	mg/kg	R21		-2,037	yes	4,05	40	2,40	4,3	4,059	1,049	25,8	17	0	0	17
	mg/kg	R22		-0,935	yes	5,49	30	4,72	5,18	5,502	0,8711	15,8	17	0	0	17
Cu	mg/kg	R1			yes			0,121	0,0356	0,06621	0,08269	124,	11	0	6	17
	mg/kg	R21			yes			0,021	0,0142	0,0413	0,07963	192,	10	0	7	17
	mg/kg	R22			yes			0,125	0,03	0,07255	0,0863	118,	11	0	6	17
F	mg/kg	R1		1,074	yes	14,9	25	16,9	16	14,88	2,404	16,1	11	4	2	17
	mg/kg	R22		0,362	yes	13,8	40	14,8	14,15	13,78	2,339	16,9	10	5	2	17
Mo	mg/kg	2R1		0,035	yes	5,74	10	5,75	5,745	5,73	0,1372	2,4	16	0	0	16
	mg/kg	R1		-2,015	yes	6,42	30	4,48	6,602	6,387	0,9057	14,1	17	0	0	17
	mg/kg	R21		-3,006	yes	5,36	35	2,54	5,51	5,274	1,357	25,7	17	0	0	17
	mg/kg	R22		-1,983	yes	6,42	30	4,51	6,515	6,383	0,9603	15,0	16	1	0	17
Ni	mg/kg	2R1			yes			0,01	0,0155	0,01725	0,00952	55,2	16	0	0	16
	mg/kg	R1						<0,05	0,0099	0,03724	0,06586	176,	6	0	11	17
	mg/kg	R21						<0,05	0,0023	0,00862	0,01159	134,	7	0	10	17
	mg/kg	R22						<0,05	0,0119	0,04965	0,07216	145,	7	0	10	17
Pb	mg/kg	2R1		0,000	yes	6,54	15	6,54	6,605	6,605	0,3396	5,1	14	2	0	16
	mg/kg	R1		-0,209	yes	6,52	50	6,18	6,615	6,554	1,491	22,7	16	1	0	17
	mg/kg	R21		-4,482	yes	1,93	40	0,20	1,76	1,632	0,8389	51,3	16	1	0	17
	mg/kg	R22		-4,810	yes	5,53	30	1,54	5,49	5,207	1,497	28,7	15	2	0	17
pH		R1		0,000	yes	12,7	3,1	12,7	12,7	12,7	0,1673	1,3	18	0	0	18
		R21		-0,500	yes	12,9	3,1	12,8	12,88	12,86	0,1458	1,1	17	1	0	18
		R22		0,000	yes	12,7	3,1	12,7	12,67	12,65	0,1661	1,3	17	1	0	18

Outlier test failed: C - Cohcran, G1 - Grubbs(1-outlier algorithm), G2 - Grubbs(2-outliers algorithm), H - Hampel, M - manual

Analyte	Unit	Sample	z-Graphics -3 -2 -1 0 +1 +2 +3	Z- value	Outl test OK	Assig-ned value	2* Targ SD%	Lab's result	Md.	Mean	SD	SD%	Pas-sed	Outl. fai-led	Mis-sing	Num of labs
Sb	mg/kg	R1						<0,05	0,006	0,03287	0,05757	175,	4	0	13	17
Laboratory 14																
Sb	mg/kg	R21						<0,05	0,00021	0,00196	0,00302	153,	5	0	12	17
	mg/kg	R22						<0,05	0,00049	0,02866	0,05794	202,	5	0	12	17
Se	mg/kg	2R1		0,267	yes	0,75	10	0,76	0,76	0,7482	0,02757	3,7	15	1	0	16
	mg/kg	R1		0,250	yes	0,64	25	0,66	0,66	0,6409	0,07771	12,1	16	1	0	17
	mg/kg	R21		-0,238	yes	0,63	40	0,60	0,6408	0,6019	0,1451	24,1	16	1	0	17
	mg/kg	R22		1,159	yes	0,69	40	0,85	0,6925	0,7006	0,1508	21,5	15	1	1	17
SO4	mg/kg	R1		-0,685	yes	24800	20	23100	24650	24790	2474	10	16	0	0	16
	mg/kg	R21		-0,612	yes	20900	25	19300	20580	20530	2799	13,6	15	1	0	16
	mg/kg	R22		1,558	yes	27600	20	31900	27150	27940	2524	9	15	1	0	16
V	mg/kg	2R1			yes			0,005	0,006	0,00673	0,00291	43,2	15	0	0	15
	mg/kg	R1						<0,01	0,00382	0,00325	0,00173	53,1	6	0	10	16
	mg/kg	R21						<0,01	0,00219	0,00188	0,00108	57,5	6	0	10	16
	mg/kg	R22						<0,01	0,00487	0,00479	0,00327	68,4	6	0	10	16
Zn	mg/kg	2R1		1,321	yes	10,6	20	12,00	10,57	10,67	0,7406	6,9	15	1	0	16
	mg/kg	R1		0,972	yes	9,6	30	11,0	10	9,543	1,503	15,7	17	0	0	17
	mg/kg	R21		-1,667	yes	2,85	40	1,90	2,92	2,517	0,8906	35,3	17	0	0	17
	mg/kg	R22		-0,342	yes	9,35	30	8,87	9,95	9,51	1,666	17,5	16	1	0	17
Laboratory 15																
As	mg/kg	2R1			yes			0,005	0,008	0,01	0,00756	75,6	14	1	1	16
	mg/kg	R1						<0,100	0,0075	0,01808	0,01984	109,	6	0	11	17
	mg/kg	R21						<0,0200	0,004	0,01078	0,01394	129,	7	0	10	17
	mg/kg	R22						<0,100	0,01	0,04847	0,07201	148,	7	0	10	17
Ba	mg/kg	2R1		0,766	yes	2,09	15	2,21	2,04	2,072	0,1162	5,6	15	1	0	16
	mg/kg	R1		-0,656	yes	2,44	20	2,28	2,401	2,439	0,2026	8,3	15	2	0	17
	mg/kg	R21		-0,566	yes	0,68	40	0,603	0,706	0,6694	0,1745	26,0	17	0	0	17
	mg/kg	R22		-0,859	yes	2,56	20	2,34	2,51	2,526	0,3481	13,7	17	0	0	17
Cd	mg/kg	2R1			yes	0,016		0,016	0,016	0,01613	0,00051	3,2	15	1	0	16
	mg/kg	R1						<0,0100	0,00448	0,00568	0,00409	71,9	8	0	9	17
	mg/kg	R21						<0,0020	0,00472	0,00845	0,01217	144,	9	0	8	17
	mg/kg	R22						<0,0100	0,0068	0,00975	0,01189	121,	9	0	8	17
Cl	mg/kg	R1		-0,420	yes	14300	10	14000	14300	14280	593	4,2	15	1	0	16
	mg/kg	R21		-0,071	yes	14100	20	14000	14000	14130	1033	7,3	15	1	0	16
	mg/kg	R22		-0,345	yes	14500	20	14000	14170	14360	905	6,3	14	2	0	16
conductivity	mS/m	R1		-1,524	yes	2100	10	1940	2095	2095	86,51	4,1	16	1	0	17
	mS/m	R21		-0,662	yes	5740	20	5360	5750	5738	323,8	5,6	13	3	0	16
	mS/m	R22		-0,690	yes	1450	20	1350	1435	1433	122,4	8,5	14	3	0	17
Cr	mg/kg	2R1		0,030	yes	6,71	20	6,73	6,795	6,599	0,76	11,5	16	0	0	16
	mg/kg	R1		-0,260	yes	6,93	30	6,66	6,968	6,848	1,21	17,6	17	0	0	17
	mg/kg	R21		-1,259	yes	4,05	40	3,03	4,3	4,059	1,049	25,8	17	0	0	17
	mg/kg	R22		-1,129	yes	5,49	30	4,56	5,18	5,502	0,8711	15,8	17	0	0	17
Cu	mg/kg	R1						<0,500	0,0356	0,06621	0,08269	124,	11	0	6	17
	mg/kg	R21						<0,100	0,0142	0,0413	0,07963	192,	10	0	7	17
	mg/kg	R22						<0,151	0,03	0,07255	0,0863	118,	11	0	6	17
DOC	mg/kg	R1			yes			130	45,95	47,19	37,97	80,4	8	0	5	13
	mg/kg	R21			yes			74	8,779	19,06	22,91	120,	9	0	4	13
	mg/kg	R22			yes			240	31,77	54,98	72,57	131,	9	0	4	13
F	mg/kg	R1		0,591	yes	14,9	25	16	16	14,88	2,404	16,1	11	4	2	17
	mg/kg	R21		0,104	yes	4,31	40	4,4	4,35	4,321	1,208	27,9	12	2	2	16
	mg/kg	R22		0,072	yes	13,8	40	14	14,15	13,78	2,339	16,9	10	5	2	17
Mo	mg/kg	2R1		0,348	yes	5,74	10	5,84	5,745	5,73	0,1372	2,4	16	0	0	16
	mg/kg	R1		-0,706	yes	6,42	30	5,74	6,602	6,387	0,9057	14,1	17	0	0	17
	mg/kg	R21		-1,962	yes	5,36	35	3,52	5,51	5,274	1,357	25,7	17	0	0	17
	mg/kg	R22		-1,755	yes	6,42	30	4,73	6,515	6,383	0,9603	15,0	16	1	0	17
Ni	mg/kg	2R1			yes			0,007	0,0155	0,01725	0,00952	55,2	16	0	0	16
	mg/kg	R1						<0,100	0,0099	0,03724	0,06586	176,	6	0	11	17
	mg/kg	R21						<0,0200	0,0023	0,00862	0,01159	134,	7	0	10	17
	mg/kg	R22						<0,100	0,0119	0,04965	0,07216	145,	7	0	10	17
Pb	mg/kg	2R1		-0,550	yes	6,54	15	6,27	6,605	6,605	0,3396	5,1	14	2	0	16
	mg/kg	R1		0,129	yes	6,52	50	6,73	6,615	6,554	1,491	22,7	16	1	0	17
	mg/kg	R21		-1,269	yes	1,93	40	1,44	1,76	1,632	0,8389	51,3	16	1	0	17
	mg/kg	R22		-0,313	yes	5,53	30	5,27	5,49	5,207	1,497	28,7	15	2	0	17
pH		R1		-0,508	yes	12,7	3,1	12,6	12,7	12,7	0,1673	1,3	18	0	0	18
		R21		-1,000	yes	12,9	3,1	12,7	12,88	12,86	0,1458	1,1	17	1	0	18
		R22		-2,032	yes	12,7	3,1	12,3	12,67	12,65	0,1661	1,3	17	1	0	18
Sb	mg/kg	R1						<0,500	0,006	0,03287	0,05757	175,	4	0	13	17
	mg/kg	R21						<0,0200	0,00021	0,00196	0,00302	153,	5	0	12	17

Outlier test failed: C - Cohcran, G1 - Grubbs(1-outlier algorithm), G2 - Grubbs(2-outliers algorithm), H - Hampel, M - manual

Analyte	Unit	Sample	z-Graphics -3 -2 -1 0 +1 +2 +3	Z- value	Outl test OK	Assig-ned value	2* Targ SD%	Lab's result	Md.	Mean	SD	SD%	Pas-sed	Outl. fai-led	Mis-sing	Num of labs
	mg/kg	R22						<0,100	0,00049	0,02866	0,05794	202,	5	0	12	17
Laboratory 15																
Se	mg/kg	2R1		0,267	yes	0,75	10	0,76	0,76	0,7482	0,02757	3,7	15	1	0	16
	mg/kg	R1		0,662	yes	0,64	25	0,693	0,66	0,6409	0,07771	12,1	16	1	0	17
	mg/kg	R21		-0,794	yes	0,63	40	0,53	0,6408	0,6019	0,1451	24,1	16	1	0	17
	mg/kg	R22		-0,819	yes	0,69	40	0,577	0,6925	0,7006	0,1508	21,5	15	1	1	17
SO4	mg/kg	R1		0,484	yes	24800	20	26000	24650	24790	2474	10	16	0	0	16
	mg/kg	R21		0,421	yes	20900	25	22000	20580	20530	2799	13,6	15	1	0	16
	mg/kg	R22		0,145	yes	27600	20	28000	27150	27940	2524	9	15	1	0	16
V	mg/kg	2R1			yes			0,005	0,006	0,00673	0,00291	43,2	15	0	0	15
	mg/kg	R1						<0,500	0,00382	0,00325	0,00173	53,1	6	0	10	16
	mg/kg	R21						<0,0200	0,00219	0,00188	0,00108	57,5	6	0	10	16
	mg/kg	R22						<0,100	0,00487	0,00479	0,00327	68,4	6	0	10	16
Zn	mg/kg	2R1		-0,198	yes	10,6	20	10,39	10,57	10,67	0,7406	6,9	15	1	0	16
	mg/kg	R1		0,417	yes	9,6	30	10,2	10	9,543	1,503	15,7	17	0	0	17
	mg/kg	R21		-1,509	yes	2,85	40	1,99	2,92	2,517	0,8906	35,3	17	0	0	17
	mg/kg	R22		-0,863	yes	9,35	30	8,14	9,95	9,51	1,666	17,5	16	1	0	17
Laboratory 16																
As	mg/kg	2R1			yes			0,009	0,008	0,01	0,00756	75,6	14	1	1	16
	mg/kg	R1						<0,0099	0,0075	0,01808	0,01984	109,	6	0	11	17
	mg/kg	R21						<0,0040	0,004	0,01078	0,01394	129,	7	0	10	17
	mg/kg	R22						<0,0200	0,01	0,04847	0,07201	148,	7	0	10	17
Ba	mg/kg	2R1		-0,319	yes	2,09	15	2,04	2,04	2,072	0,1162	5,6	15	1	0	16
	mg/kg	R1		0,123	yes	2,44	20	2,47	2,401	2,439	0,2026	8,3	15	2	0	17
	mg/kg	R21		0,191	yes	0,68	40	0,706	0,706	0,6694	0,1745	26,0	17	0	0	17
	mg/kg	R22		-0,586	yes	2,56	20	2,41	2,51	2,526	0,3481	13,7	17	0	0	17
Cd	mg/kg	2R1			yes	0,016		0,016	0,016	0,01613	0,00051	3,2	15	1	0	16
	mg/kg	R1			yes			0,00481	0,00448	0,00568	0,00409	71,9	8	0	9	17
	mg/kg	R21			yes			0,00472	0,00472	0,00845	0,01217	144,	9	0	8	17
	mg/kg	R22			yes			0,00680	0,0068	0,00975	0,01189	121,	9	0	8	17
Cl	mg/kg	R1		0,140	yes	14300	10	14400	14300	14280	593	4,2	15	1	0	16
	mg/kg	R21		2,057	yes	14100	20	17000	14000	14130	1033	7,3	15	1	0	16
	mg/kg	R22		1,724	yes	14500	20	17000	14170	14360	905	6,3	14	2	0	16
conductivity	mS/m	R1		-19,790	H	2100	10	21,6	2095	2095	86,51	4,1	16	1	0	17
	mS/m	R21		-9,893	H	5740	20	61,2	5750	5738	323,8	5,6	13	3	0	16
	mS/m	R22		-9,895	H	1450	20	15,22	1435	1433	122,4	8,5	14	3	0	17
Cr	mg/kg	2R1		-0,119	yes	6,71	20	6,63	6,795	6,599	0,76	11,5	16	0	0	16
	mg/kg	R1		0,644	yes	6,93	30	7,60	6,968	6,848	1,21	17,6	17	0	0	17
	mg/kg	R21		1,815	yes	4,05	40	5,52	4,3	4,059	1,049	25,8	17	0	0	17
	mg/kg	R22		2,016	yes	5,49	30	7,15	5,18	5,502	0,8711	15,8	17	0	0	17
Cu	mg/kg	R1			yes			0,0726	0,0356	0,06621	0,08269	124,	11	0	6	17
	mg/kg	R21			yes			0,0604	0,0142	0,0413	0,07963	192,	10	0	7	17
	mg/kg	R22			yes			0,116	0,03	0,07255	0,0863	118,	11	0	6	17
DOC	mg/kg	R1			yes			49,9	45,95	47,19	37,97	80,4	8	0	5	13
	mg/kg	R21			yes			28,0	8,779	19,06	22,91	120,	9	0	4	13
	mg/kg	R22			yes			61,3	31,77	54,98	72,57	131,	9	0	4	13
F	mg/kg	R1			H	14,9	25	<24,9	16	14,88	2,404	16,1	11	4	2	17
	mg/kg	R21				4,31	40	<20,0	4,35	4,321	1,208	27,9	12	2	2	16
	mg/kg	R22			H	13,8	40	<100	14,15	13,78	2,339	16,9	10	5	2	17
Mo	mg/kg	2R1		0,418	yes	5,74	10	5,86	5,745	5,73	0,1372	2,4	16	0	0	16
	mg/kg	R1		0,291	yes	6,42	30	6,70	6,602	6,387	0,9057	14,1	17	0	0	17
	mg/kg	R21		0,874	yes	5,36	35	6,18	5,51	5,274	1,357	25,7	17	0	0	17
	mg/kg	R22		0,696	yes	6,42	30	7,09	6,515	6,383	0,9603	15,0	16	1	0	17
Ni	mg/kg	2R1			yes			0,018	0,0155	0,01725	0,00952	55,2	16	0	0	16
	mg/kg	R1						<0,0049	0,0099	0,03724	0,06586	176,	6	0	11	17
	mg/kg	R21						<0,0010	0,0023	0,00862	0,01159	134,	7	0	10	17
	mg/kg	R22						<0,0050	0,0119	0,04965	0,07216	145,	7	0	10	17
Pb	mg/kg	2R1		-0,367	yes	6,54	15	6,36	6,605	6,605	0,3396	5,1	14	2	0	16
	mg/kg	R1		-0,399	yes	6,52	50	5,87	6,615	6,554	1,491	22,7	16	1	0	17
	mg/kg	R21		12,820	M	1,93	40	6,88	1,76	1,632	0,8389	51,3	16	1	0	17
	mg/kg	R22		-3,797	M	5,53	30	2,38	5,49	5,207	1,497	28,7	15	2	0	17
pH		R1		-0,610	yes	12,7	3,1	12,58	12,7	12,7	0,1673	1,3	18	0	0	18
		R21		-0,050	yes	12,9	3,1	12,89	12,88	12,86	0,1458	1,1	17	1	0	18
		R22		-0,152	yes	12,7	3,1	12,67	12,67	12,65	0,1661	1,3	17	1	0	18
Sb	mg/kg	R1						<0,0010	0,006	0,03287	0,05757	175,	4	0	13	17
	mg/kg	R21			yes			0,000	0,00021	0,00196	0,00302	153,	5	0	12	17
	mg/kg	R22			yes			0,00022	0,00049	0,02866	0,05794	202,	5	0	12	17
Se	mg/kg	2R1		0,267	yes	0,75	10	0,76	0,76	0,7482	0,02757	3,7	15	1	0	16

Outlier test failed: C - Cohcran, G1 - Grubbs(1-outlier algorithm), G2 - Grubbs(2-outliers algorithm), H - Hampel, M - manual

Analyte	Unit	Sample	z-Graphics -3 -2 -1 0 +1 +2 +3	Z- value	Outl test OK	Assig-ned value	2* Targ SD%	Lab's result	Md.	Mean	SD	SD%	Pas-sed	Outl. fai-led	Mis-sing	Num of labs
	mg/kg	R1		-0,613	yes	0,64	25	0,591	0,66	0,6409	0,07771	12,1	16	1	0	17
Laboratory 16																
Se	mg/kg	R21		-1,159	yes	0,63	40	0,484	0,6408	0,6019	0,1451	24,1	16	1	0	17
	mg/kg	R22		-0,949	yes	0,69	40	0,559	0,6925	0,7006	0,1508	21,5	15	1	1	17
SO4	mg/kg	R1		0,000	yes	24800	20	24800	24650	24790	2474	10	16	0	0	16
	mg/kg	R21		1,990	yes	20900	25	26100	20580	20530	2799	13,6	15	1	0	16
	mg/kg	R22		2,428	yes	27600	20	34300	27150	27940	2524	9	15	1	0	16
V	mg/kg	2R1			yes			0,007	0,006	0,00673	0,00291	43,2	15	0	0	15
	mg/kg	R1			yes			0,00389	0,00382	0,00325	0,00173	53,1	6	0	10	16
	mg/kg	R21			yes			0,00238	0,00219	0,00188	0,00108	57,5	6	0	10	16
	mg/kg	R22			yes			0,00474	0,00487	0,00479	0,00327	68,4	6	0	10	16
Zn	mg/kg	2R1		0,000	yes	10,6	20	10,60	10,57	10,67	0,7406	6,9	15	1	0	16
	mg/kg	R1		0,833	yes	9,6	30	10,8	10	9,543	1,503	15,7	17	0	0	17
	mg/kg	R21		0,123	yes	2,85	40	2,92	2,92	2,517	0,8906	35,3	17	0	0	17
	mg/kg	R22		0,464	yes	9,35	30	10,0	9,95	9,51	1,666	17,5	16	1	0	17
Laboratory 17																
Cl	mg/kg	R1		1,077	yes	14300	10	15070	14300	14280	593	4,2	15	1	0	16
	mg/kg	R21		0,284	yes	14100	20	14500	14000	14130	1033	7,3	15	1	0	16
	mg/kg	R22		-0,314	yes	14500	20	14045	14170	14360	905	6,3	14	2	0	16
conductivity	mS/m	R1		0,191	yes	2100	10	2120	2095	2095	86,51	4,1	16	1	0	17
	mS/m	R21		0,383	yes	5740	20	5960	5750	5738	323,8	5,6	13	3	0	16
	mS/m	R22		-0,172	yes	1450	20	1425	1435	1433	122,4	8,5	14	3	0	17
F	mg/kg	R1		7,946	H	14,9	25	29,7	16	14,88	2,404	16,1	11	4	2	17
	mg/kg	R21		16,810	H	4,31	40	18,8	4,35	4,321	1,208	27,9	12	2	2	16
	mg/kg	R22		5,000	H	13,8	40	27,6	14,15	13,78	2,339	16,9	10	5	2	17
pH		R1		0,203	yes	12,7	3,1	12,74	12,7	12,7	0,1673	1,3	18	0	0	18
		R21		0,750	yes	12,9	3,1	13,05	12,88	12,86	0,1458	1,1	17	1	0	18
		R22		0,610	yes	12,7	3,1	12,82	12,67	12,65	0,1661	1,3	17	1	0	18
Laboratory 18																
As	mg/kg	2R1			yes			0,020	0,008	0,01	0,00756	75,6	14	1	1	16
	mg/kg	R1						<0,01	0,0075	0,01808	0,01984	109,	6	0	11	17
	mg/kg	R21						<0,002	0,004	0,01078	0,01394	129,	7	0	10	17
	mg/kg	R22						<0,01	0,01	0,04847	0,07201	148,	7	0	10	17
Ba	mg/kg	2R1		0,128	yes	2,09	15	2,11	2,04	2,072	0,1162	5,6	15	1	0	16
	mg/kg	R1		-0,164	yes	2,44	20	2,40	2,401	2,439	0,2026	8,3	15	2	0	17
	mg/kg	R21		-1,029	yes	0,68	40	0,54	0,706	0,6694	0,1745	26,0	17	0	0	17
	mg/kg	R22		-0,273	yes	2,56	20	2,49	2,51	2,526	0,3481	13,7	17	0	0	17
Cd	mg/kg	2R1			yes	0,016		0,016	0,016	0,01613	0,00051	3,2	15	1	0	16
	mg/kg	R1			yes			0,004	0,00448	0,00568	0,00409	71,9	8	0	9	17
	mg/kg	R21			yes			0,003	0,00472	0,00845	0,01217	144,	9	0	8	17
	mg/kg	R22			yes			0,004	0,0068	0,00975	0,01189	121,	9	0	8	17
Cl	mg/kg	R1		0,000	yes	14300	10	14300	14300	14280	593	4,2	15	1	0	16
	mg/kg	R21		-0,142	yes	14100	20	13900	14000	14130	1033	7,3	15	1	0	16
	mg/kg	R22		-0,690	yes	14500	20	13500	14170	14360	905	6,3	14	2	0	16
conductivity	mS/m	R1		-0,191	yes	2100	10	2080	2095	2095	86,51	4,1	16	1	0	17
	mS/m	R21		0,035	yes	5740	20	5760	5750	5738	323,8	5,6	13	3	0	16
	mS/m	R22		0,345	yes	1450	20	1500	1435	1433	122,4	8,5	14	3	0	17
Cr	mg/kg	2R1		-0,134	yes	6,71	20	6,62	6,795	6,599	0,76	11,5	16	0	0	16
	mg/kg	R1		-0,067	yes	6,93	30	6,86	6,968	6,848	1,21	17,6	17	0	0	17
	mg/kg	R21		0,309	yes	4,05	40	4,30	4,3	4,059	1,049	25,8	17	0	0	17
	mg/kg	R22		-0,534	yes	5,49	30	5,05	5,18	5,502	0,8711	15,8	17	0	0	17
Cu	mg/kg	R1			yes			0,053	0,0356	0,06621	0,08269	124,	11	0	6	17
	mg/kg	R21			yes			0,011	0,0142	0,0413	0,07963	192,	10	0	7	17
	mg/kg	R22			yes			0,038	0,03	0,07255	0,0863	118,	11	0	6	17
DOC	mg/kg	R1						<1	45,95	47,19	37,97	80,4	8	0	5	13
	mg/kg	R21						<0,2	8,779	19,06	22,91	120,	9	0	4	13
	mg/kg	R22						<1	31,77	54,98	72,57	131,	9	0	4	13
F	mg/kg	R1		-1,664	yes	14,9	25	11,8	16	14,88	2,404	16,1	11	4	2	17
	mg/kg	R21		-2,448	yes	4,31	40	2,2	4,35	4,321	1,208	27,9	12	2	2	16
	mg/kg	R22		-1,623	yes	13,8	40	9,32	14,15	13,78	2,339	16,9	10	5	2	17
Mo	mg/kg	2R1		-0,488	yes	5,74	10	5,60	5,745	5,73	0,1372	2,4	16	0	0	16
	mg/kg	R1		-0,343	yes	6,42	30	6,09	6,602	6,387	0,9057	14,1	17	0	0	17
	mg/kg	R21		-0,192	yes	5,36	35	5,18	5,51	5,274	1,357	25,7	17	0	0	17
	mg/kg	R22		-0,447	yes	6,42	30	5,99	6,515	6,383	0,9603	15,0	16	1	0	17
Ni	mg/kg	2R1			yes			0,013	0,0155	0,01725	0,00952	55,2	16	0	0	16
	mg/kg	R1						<0,01	0,0099	0,03724	0,06586	176,	6	0	11	17
	mg/kg	R21						<0,002	0,0023	0,00862	0,01159	134,	7	0	10	17

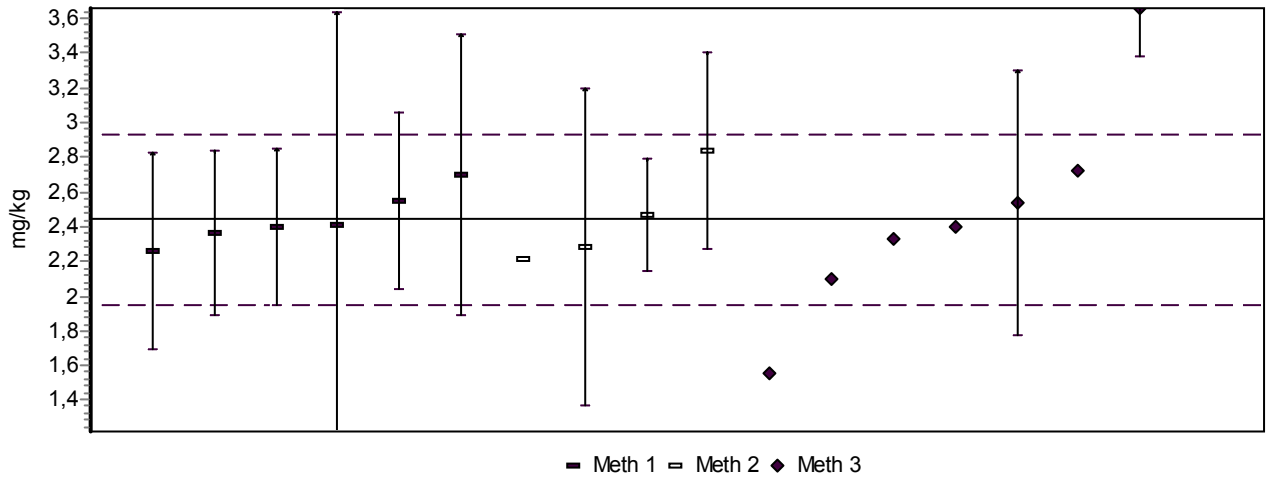
Outlier test failed: C - Cohcran, G1 - Grubbs(1-outlier algorithm), G2 - Grubbs(2-outliers algorithm), H - Hampel, M - manual

Analyte	Unit	Sample	z-Graphics -3 -2 -1 0 +1 +2 +3	Z- value	Outl test OK	Assig-ned value	2* Targ SD%	Lab's result	Md.	Mean	SD	SD%	Pas-sed	Outl. fai-led	Mis-sing	Num of labs
	mg/kg	R22						<0,01	0,0119	0,04965	0,07216	145,	7	0	10	17
Laboratory 18																
Pb	mg/kg	2R1		0,020	yes	6,54	15	6,55	6,605	6,605	0,3396	5,1	14	2	0	16
	mg/kg	R1		-0,117	yes	6,52	50	6,33	6,615	6,554	1,491	22,7	16	1	0	17
	mg/kg	R21		-1,865	yes	1,93	40	1,21	1,76	1,632	0,8389	51,3	16	1	0	17
	mg/kg	R22		-1,724	yes	5,53	30	4,10	5,49	5,207	1,497	28,7	15	2	0	17
pH		R1		1,524	yes	12,7	3,1	13,0	12,7	12,7	0,1673	1,3	18	0	0	18
		R21		1,000	yes	12,9	3,1	13,1	12,88	12,86	0,1458	1,1	17	1	0	18
		R22		1,524	yes	12,7	3,1	13,0	12,67	12,65	0,1661	1,3	17	1	0	18
Sb	mg/kg	R1						<0,01	0,006	0,03287	0,05757	175,	4	0	13	17
	mg/kg	R21						<0,002	0,00021	0,00196	0,00302	153,	5	0	12	17
	mg/kg	R22						<0,01	0,00049	0,02866	0,05794	202,	5	0	12	17
Se	mg/kg	2R1		0,267	yes	0,75	10	0,76	0,76	0,7482	0,02757	3,7	15	1	0	16
	mg/kg	R1		-1,250	yes	0,64	25	0,54	0,66	0,6409	0,07771	12,1	16	1	0	17
	mg/kg	R21		-0,762	yes	0,63	40	0,534	0,6408	0,6019	0,1451	24,1	16	1	0	17
	mg/kg	R22		-0,783	yes	0,69	40	0,582	0,6925	0,7006	0,1508	21,5	15	1	1	17
SO4	mg/kg	R1		-0,726	yes	24800	20	23000	24650	24790	2474	10	16	0	0	16
	mg/kg	R21		-0,459	yes	20900	25	19700	20580	20530	2799	13,6	15	1	0	16
	mg/kg	R22		-0,870	yes	27600	20	25200	27150	27940	2524	9	15	1	0	16
V	mg/kg	2R1			yes			0,006	0,006	0,00673	0,00291	43,2	15	0	0	15
	mg/kg	R1						<0,02	0,00382	0,00325	0,00173	53,1	6	0	10	16
	mg/kg	R21						<0,004	0,00219	0,00188	0,00108	57,5	6	0	10	16
	mg/kg	R22						<0,02	0,00487	0,00479	0,00327	68,4	6	0	10	16
Zn	mg/kg	2R1		-0,189	yes	10,6	20	10,40	10,57	10,67	0,7406	6,9	15	1	0	16
	mg/kg	R1		-0,507	yes	9,6	30	8,87	10	9,543	1,503	15,7	17	0	0	17
	mg/kg	R21		-0,754	yes	2,85	40	2,42	2,92	2,517	0,8906	35,3	17	0	0	17
	mg/kg	R22		-2,053	yes	9,35	30	6,47	9,95	9,51	1,666	17,5	16	1	0	17
Laboratory 19																
As	mg/kg	2R1			H			<0,002	0,008	0,01	0,00756	75,6	14	1	1	16
	mg/kg	R1						<0,05	0,0075	0,01808	0,01984	109,	6	0	11	17
Ba	mg/kg	2R1		1,404	yes	2,09	15	2,31	2,04	2,072	0,1162	5,6	15	1	0	16
	mg/kg	R1		1,639	yes	2,44	20	2,84	2,401	2,439	0,2026	8,3	15	2	0	17
Cd	mg/kg	2R1			yes	0,016		0,015	0,016	0,01613	0,00051	3,2	15	1	0	16
	mg/kg	R1						<0,004	0,00448	0,00568	0,00409	71,9	8	0	9	17
Cl	mg/kg	R1		0,140	yes	14300	10	14400	14300	14280	593	4,2	15	1	0	16
conductivity	mS/m	R1		-0,333	yes	2100	10	2065	2095	2095	86,51	4,1	16	1	0	17
Cr	mg/kg	2R1		1,118	yes	6,71	20	7,46	6,795	6,599	0,76	11,5	16	0	0	16
	mg/kg	R1		-1,116	yes	6,93	30	5,77	6,968	6,848	1,21	17,6	17	0	0	17
Cu	mg/kg	R1			yes			0,0242	0,0356	0,06621	0,08269	124,	11	0	6	17
DOC	mg/kg	R1			yes			12,4	45,95	47,19	37,97	80,4	8	0	5	13
F	mg/kg	R1		1,074	yes	14,9	25	16,9	16	14,88	2,404	16,1	11	4	2	17
Mo	mg/kg	2R1		-0,488	yes	5,74	10	5,60	5,745	5,73	0,1372	2,4	16	0	0	16
	mg/kg	R1		-1,495	yes	6,42	30	4,98	6,602	6,387	0,9057	14,1	17	0	0	17
Ni	mg/kg	2R1			yes			0,012	0,0155	0,01725	0,00952	55,2	16	0	0	16
	mg/kg	R1						<0,02	0,0099	0,03724	0,06586	176,	6	0	11	17
Pb	mg/kg	2R1		0,408	yes	6,54	15	6,74	6,605	6,605	0,3396	5,1	14	2	0	16
	mg/kg	R1		-0,779	yes	6,52	50	5,25	6,615	6,554	1,491	22,7	16	1	0	17
pH		R1		-0,508	yes	12,7	3,1	12,6	12,7	12,7	0,1673	1,3	18	0	0	18
Sb	mg/kg	R1						<0,10	0,006	0,03287	0,05757	175,	4	0	13	17
Se	mg/kg	2R1		0,880	yes	0,75	10	0,783	0,76	0,7482	0,02757	3,7	15	1	0	16
	mg/kg	R1		0,013	yes	0,64	25	0,641	0,66	0,6409	0,07771	12,1	16	1	0	17
SO4	mg/kg	R1		-0,282	yes	24800	20	24100	24650	24790	2474	10	16	0	0	16
V	mg/kg	2R1			yes			0,002	0,006	0,00673	0,00291	43,2	15	0	0	15
	mg/kg	R1						<0,010	0,00382	0,00325	0,00173	53,1	6	0	10	16
Zn	mg/kg	2R1		-1,019	yes	10,6	20	9,52	10,57	10,67	0,7406	6,9	15	1	0	16
	mg/kg	R1		-1,819	yes	9,6	30	6,98	10	9,543	1,503	15,7	17	0	0	17

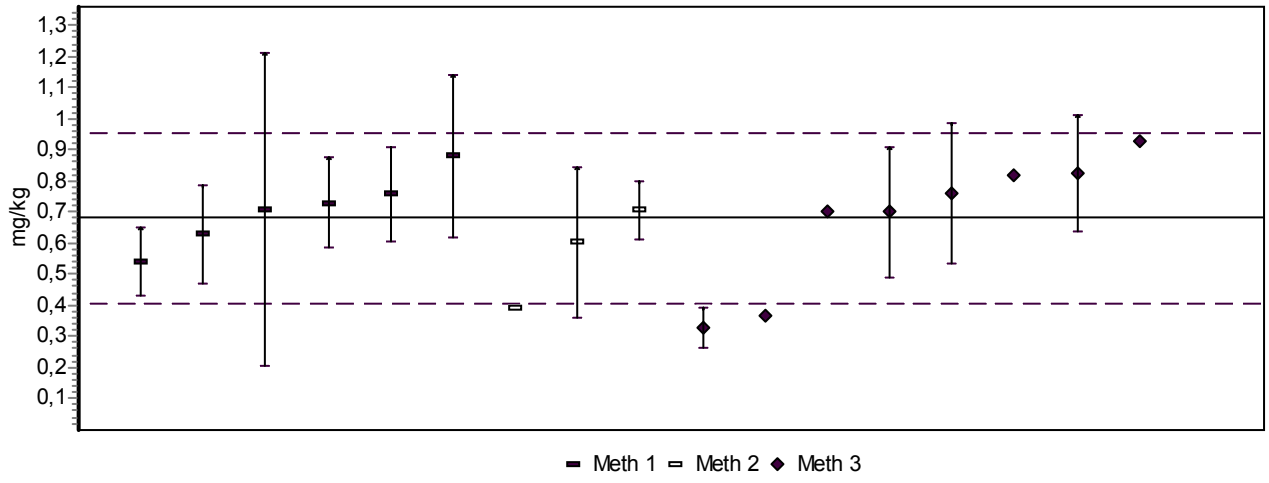
Outlier test failed: C - Cohcran, G1 - Grubbs(1-outlier algorithm), G2 - Grubbs(2-outliers algorithm), H - Hampel, M - manual

LIITE 8. RESULTS GROUPED ACCORDING TO THE METHODS
APPENDIX 8.

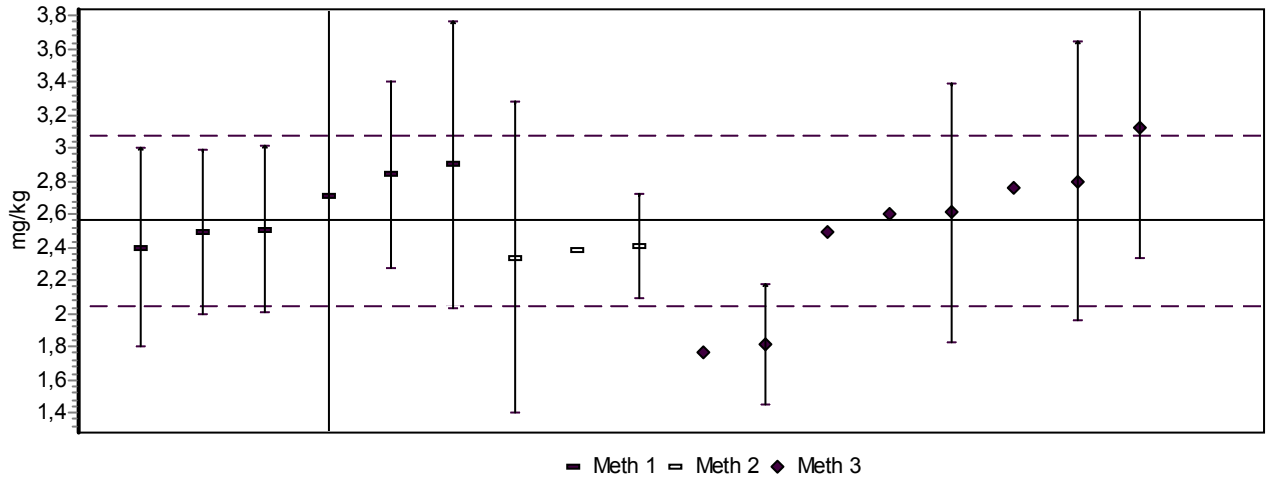
Analyytti *(Analyte)* **Ba** Näyte *(Sample)* R1



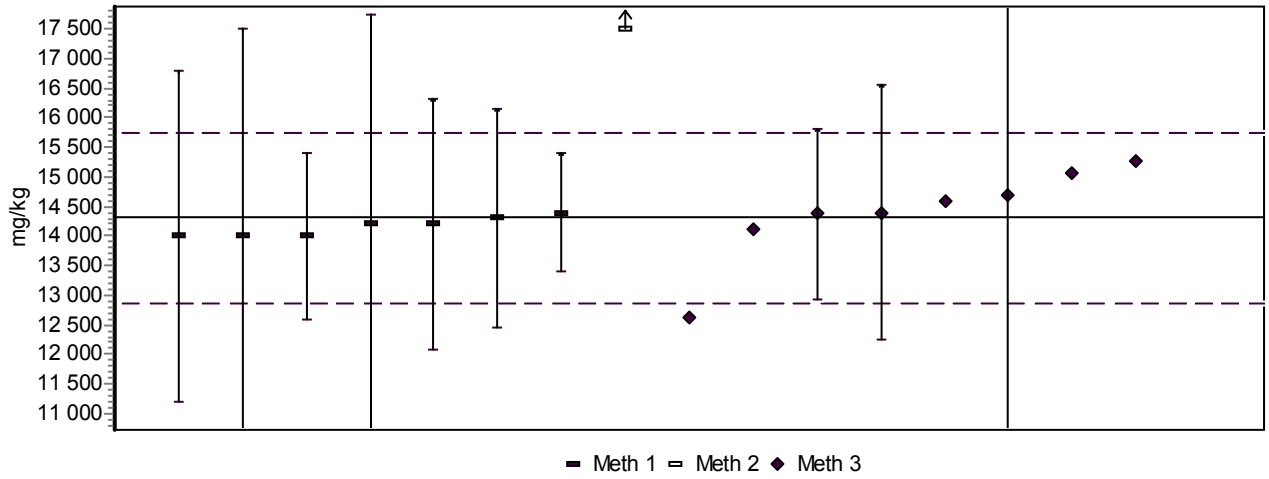
Analyytti *(Analyte)* **Ba** Näyte *(Sample)* R21



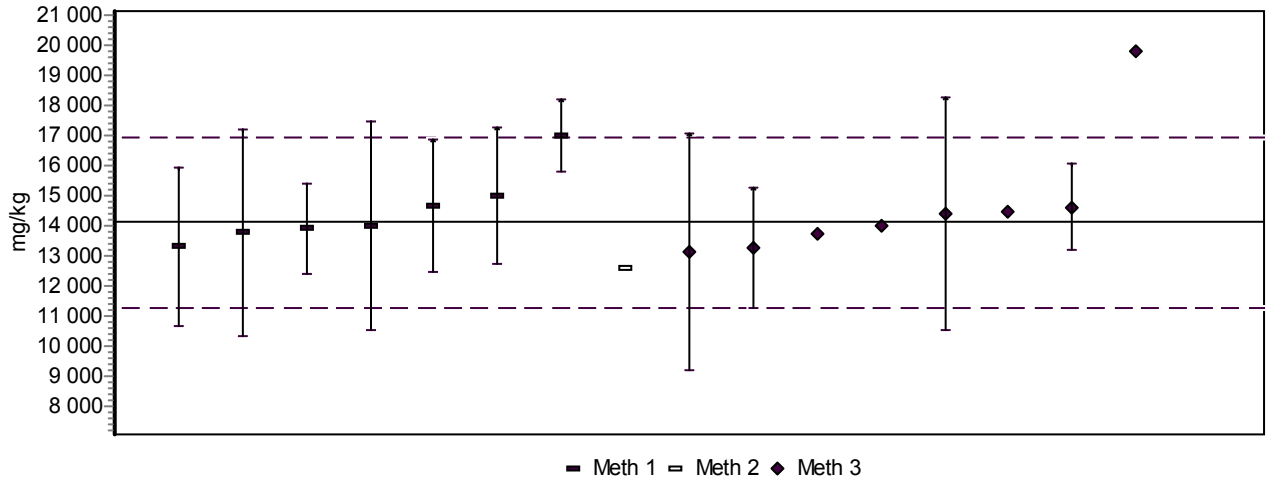
Analyytti *(Analyte)* **Ba** Näyte *(Sample)* R22



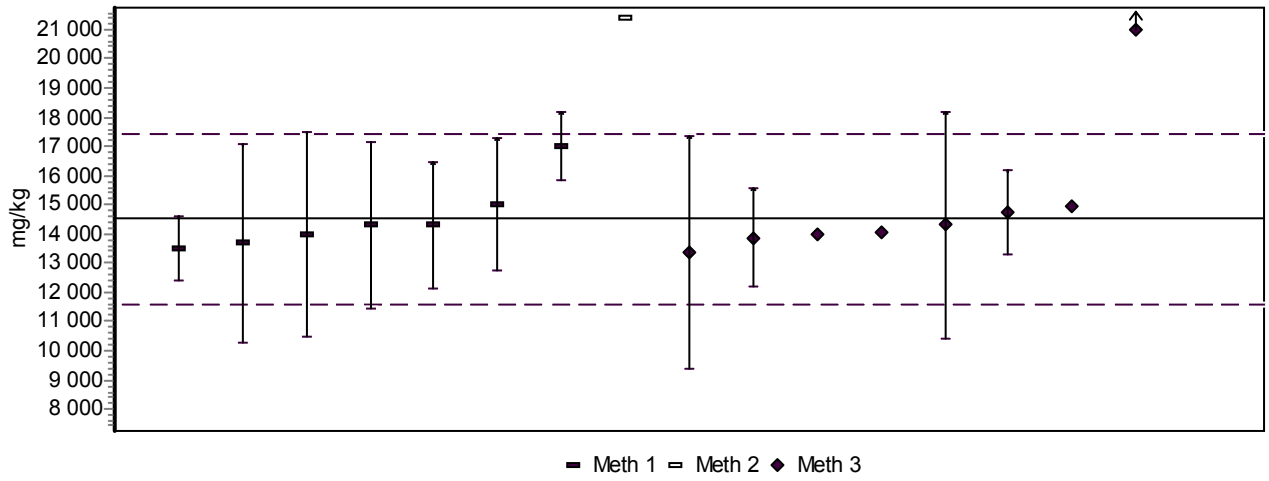
Analyytti *(Analyte)* **Cl** Näyte *(Sample)* R1



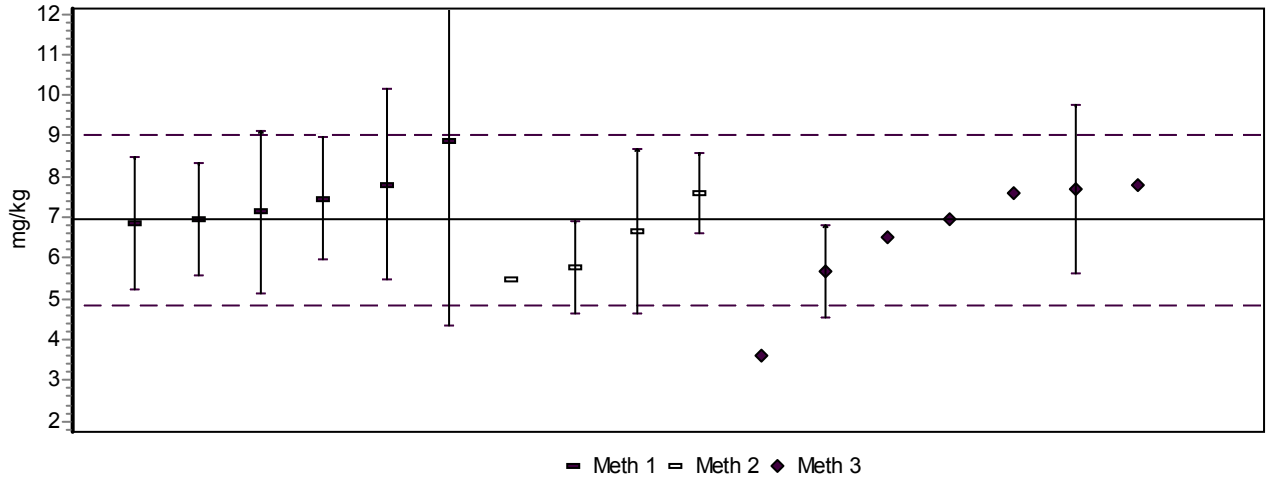
Analyytti *(Analyte)* **Cl** Näyte *(Sample)* R21



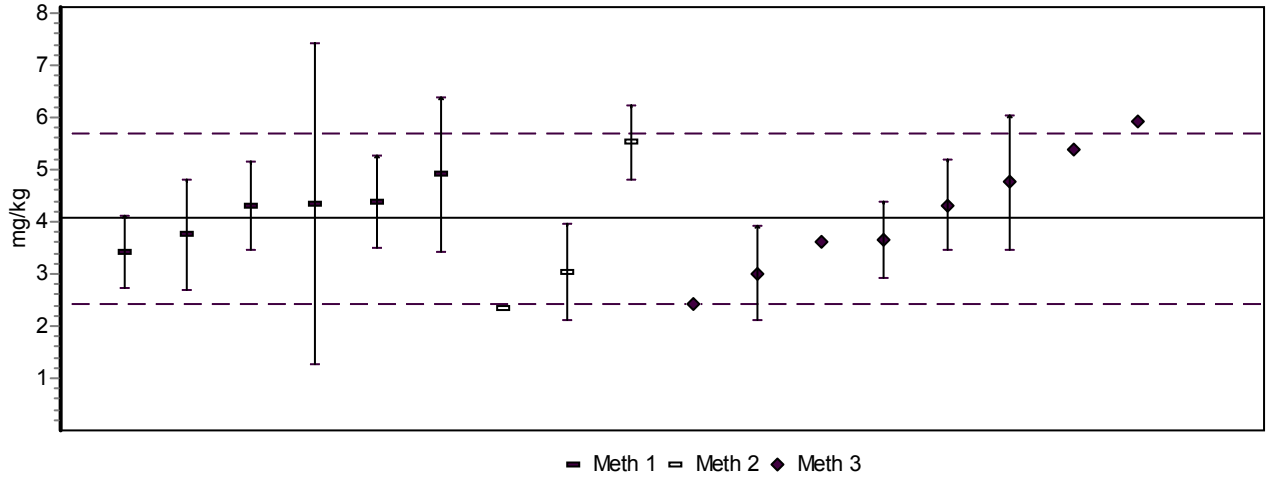
Analyytti *(Analyte)* **Cl** Näyte *(Sample)* R22



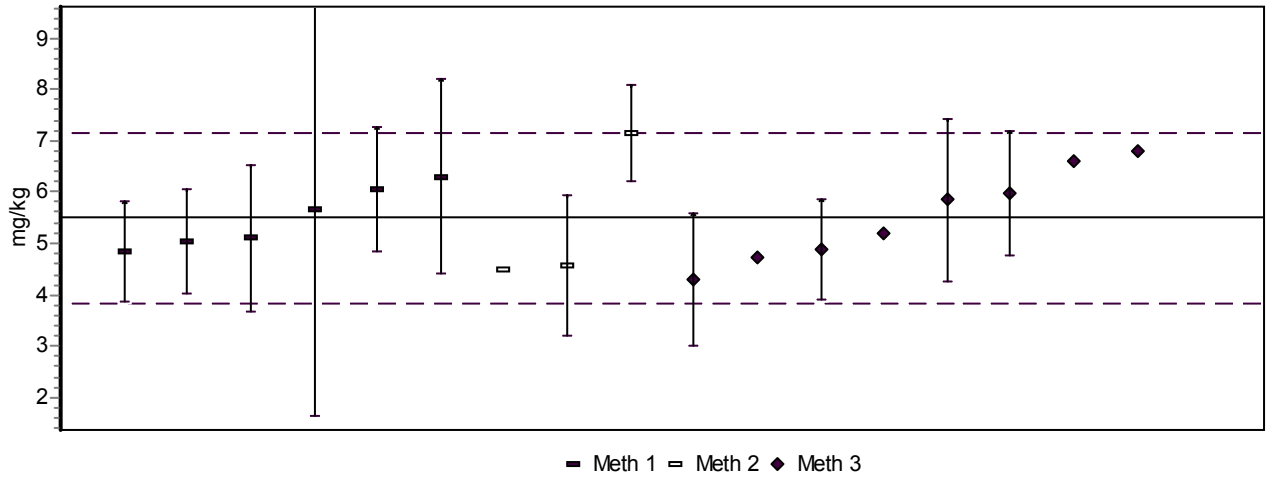
Analyytti *(Analyte)* **Cr** Näyte *(Sample)* R1



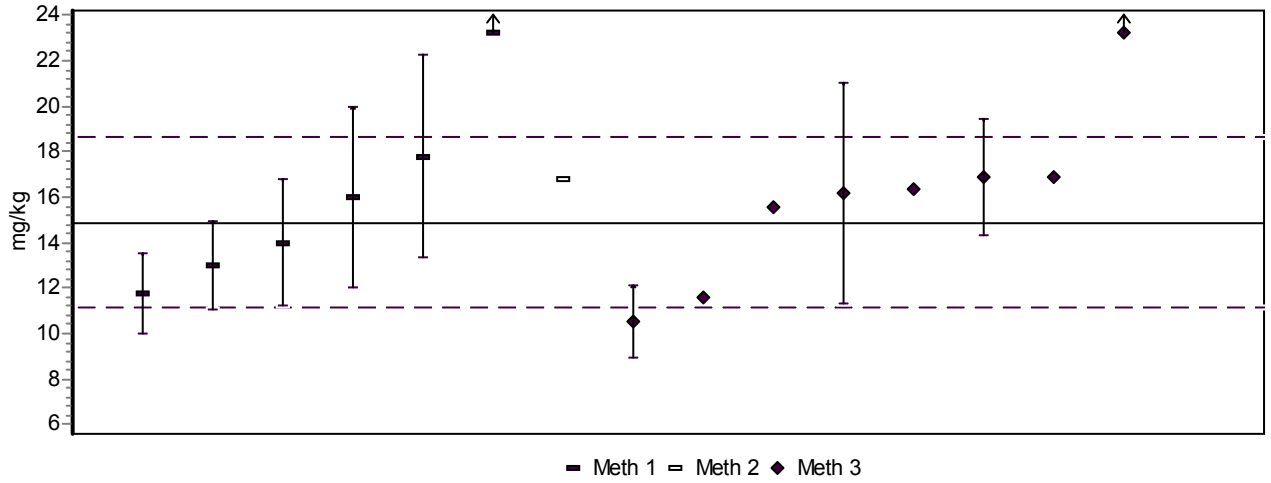
Analyytti *(Analyte)* **Cr** Näyte *(Sample)* R21



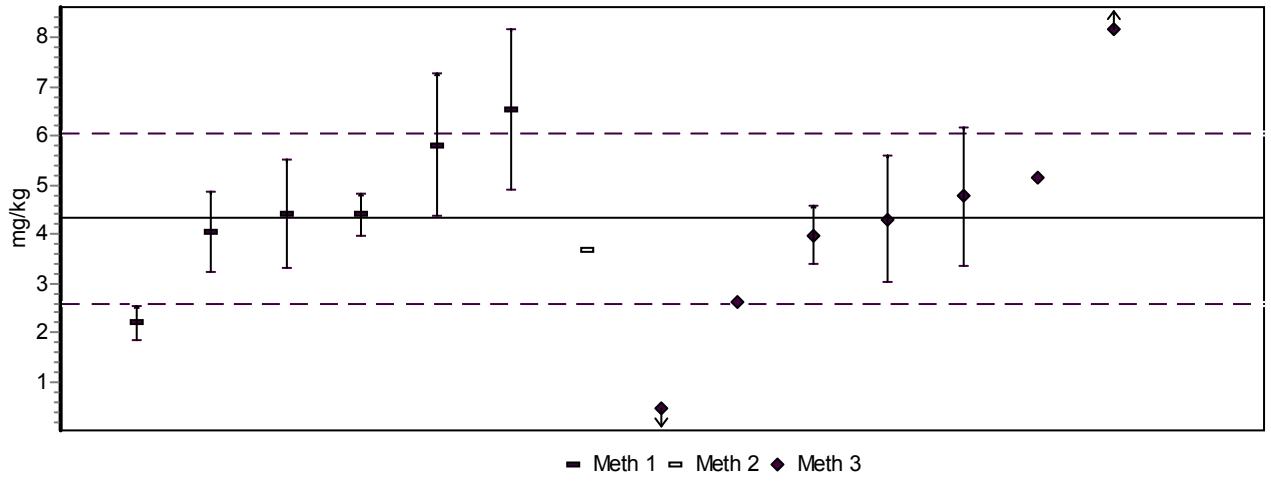
Analyytti *(Analyte)* **Cr** Näyte *(Sample)* R22



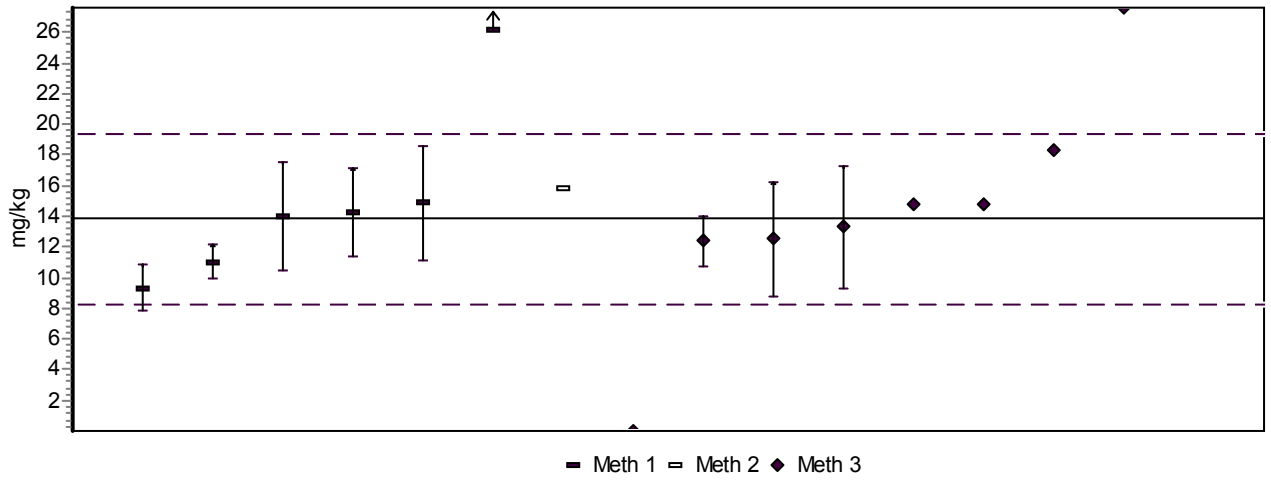
Analyytti *(Analyte)* **F** Näyte *(Sample)* R1



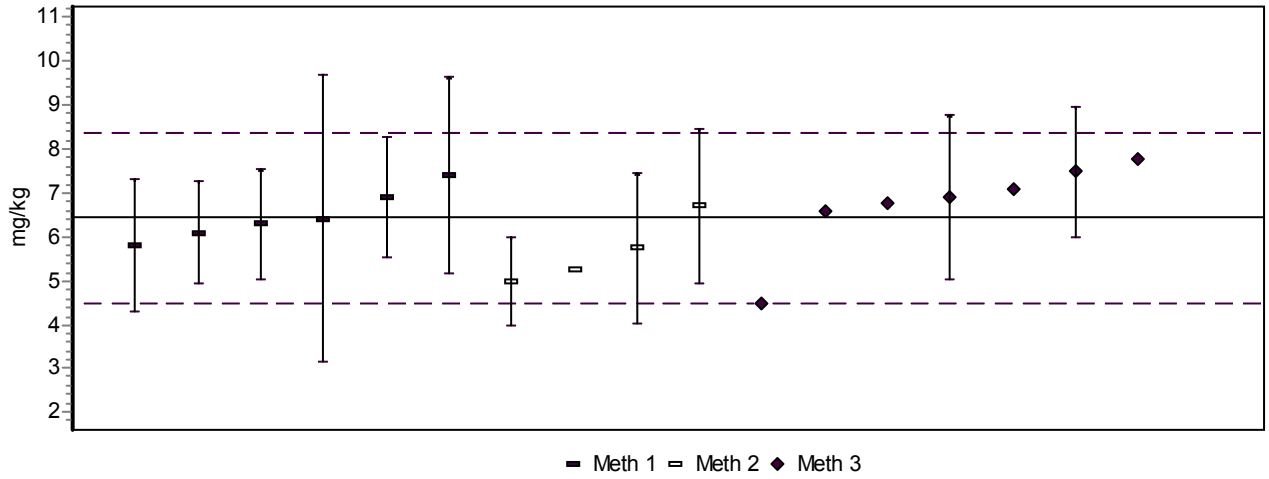
Analyytti *(Analyte)* **F** Näyte *(Sample)* R21



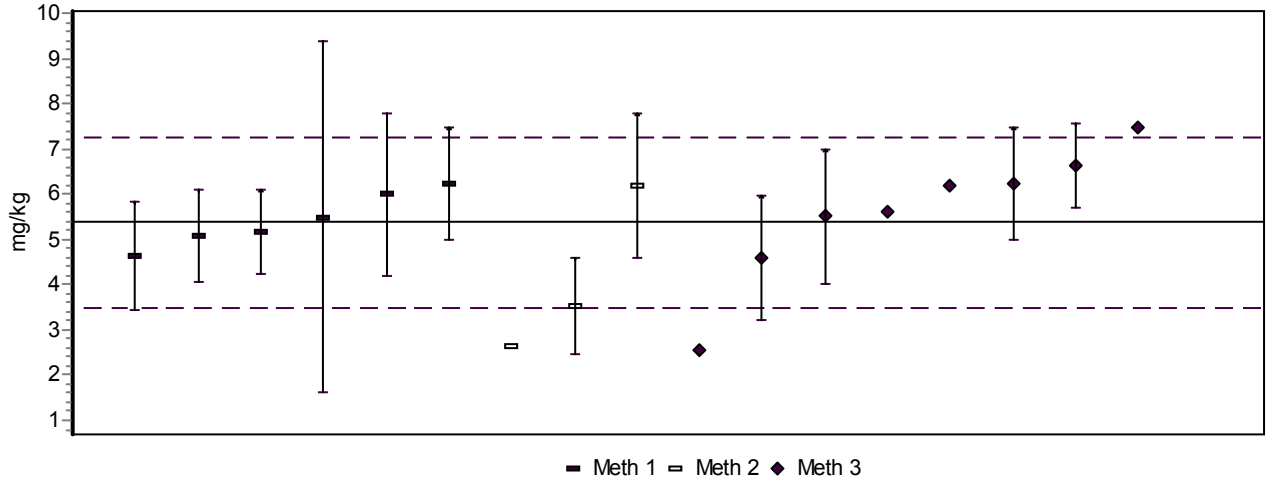
Analyytti *(Analyte)* **F** Näyte *(Sample)* R22



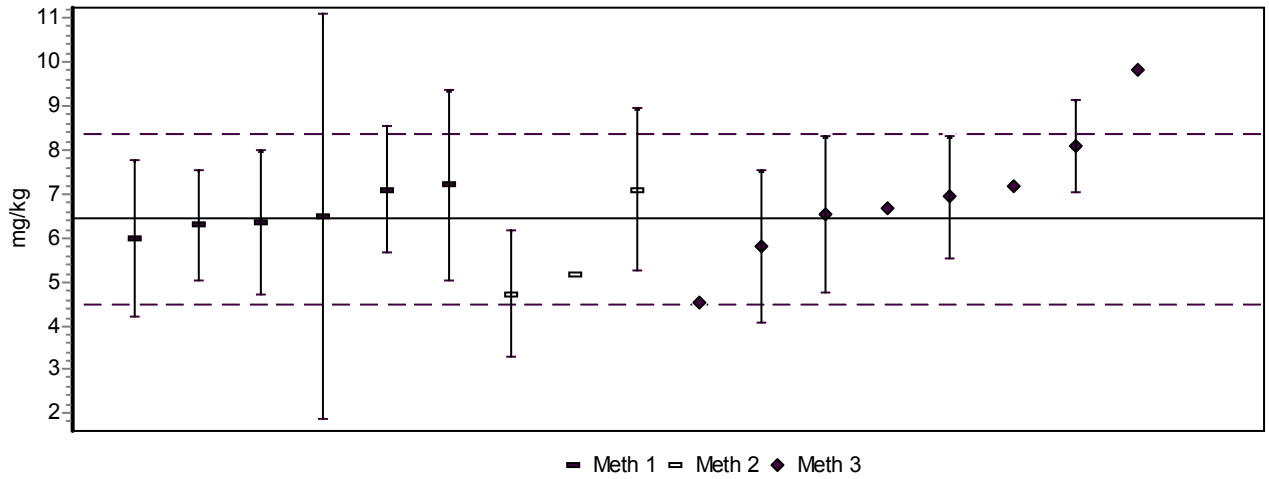
Analyytti *(Analyte)* **Mo** Näyte *(Sample)* R1



Analyytti *(Analyte)* **Mo** Näyte *(Sample)* R21



Analyytti *(Analyte)* **Mo** Näyte *(Sample)* R22



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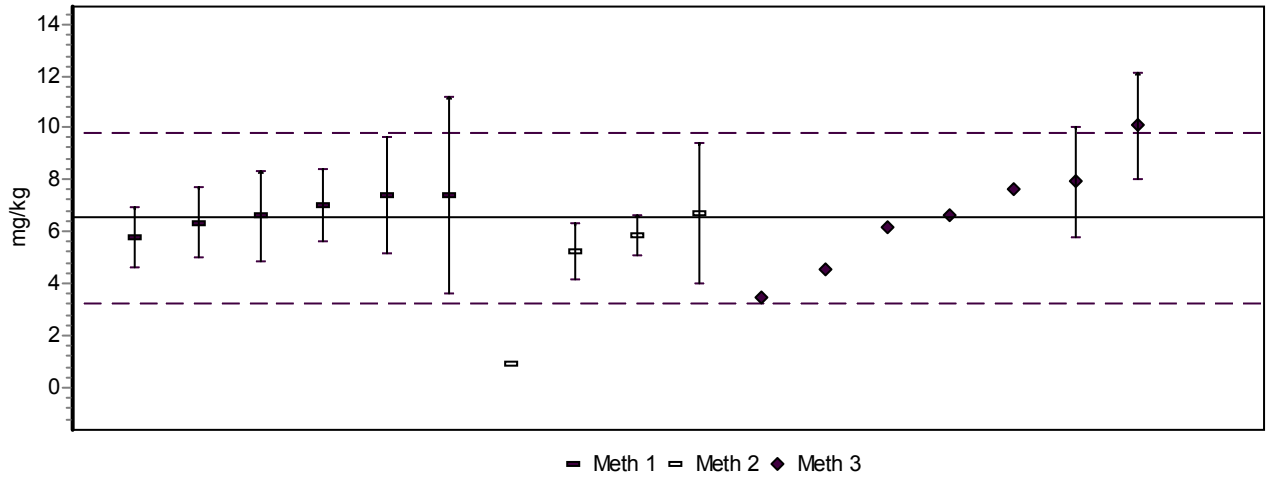
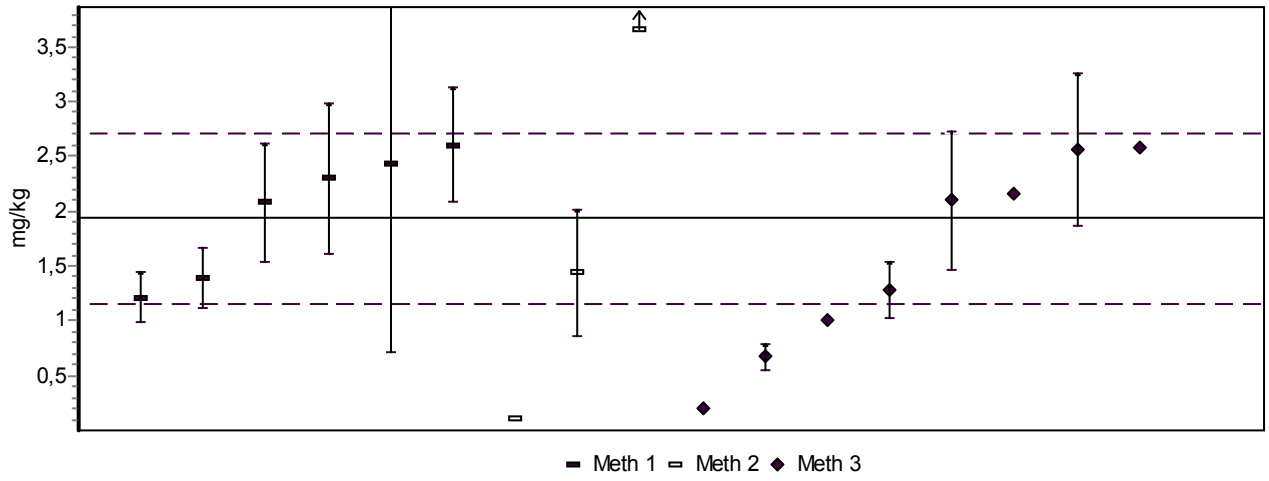
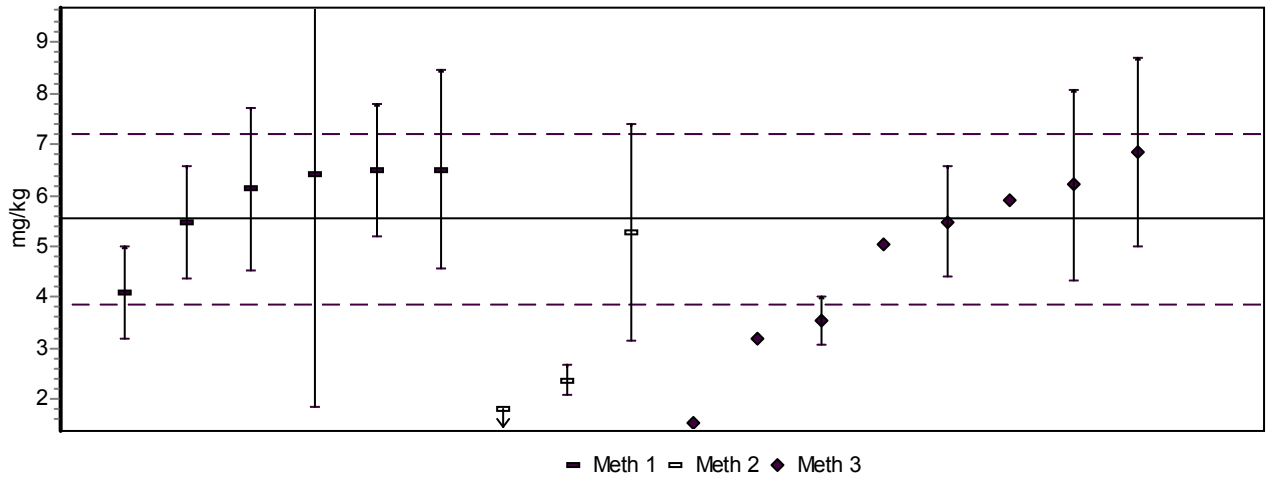


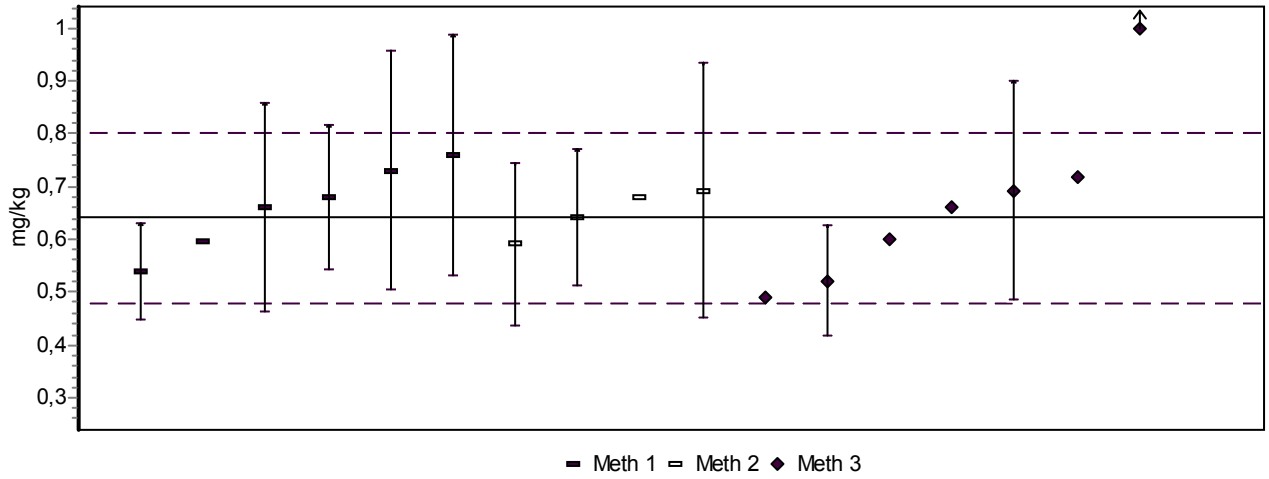
Analyytti *(Analyte)* **Pb** Näyte *(Sample)* R21



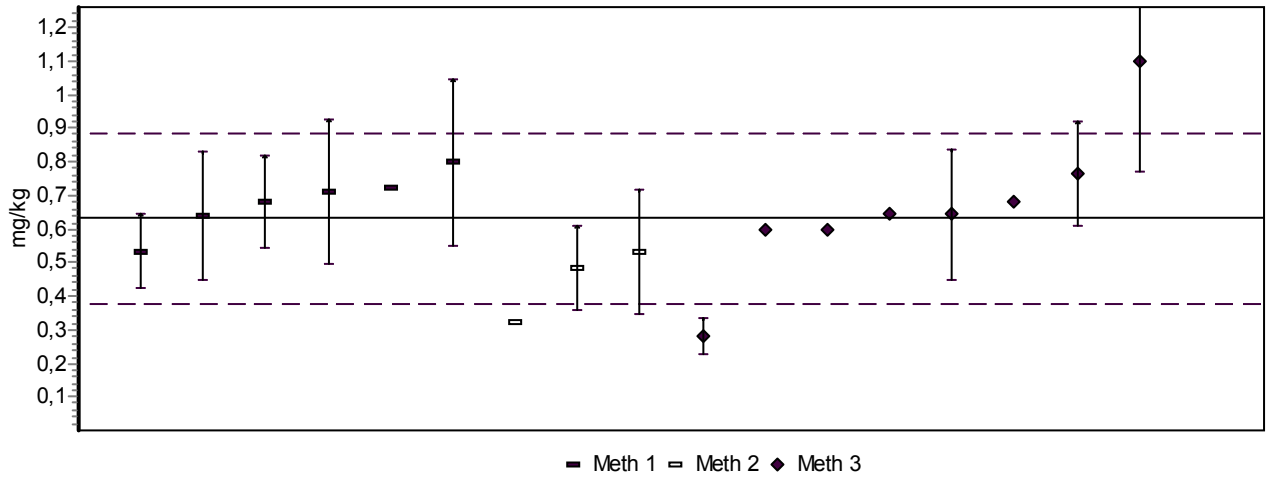
Analyytti *(Analyte)* **Pb** Näyte *(Sample)* R22



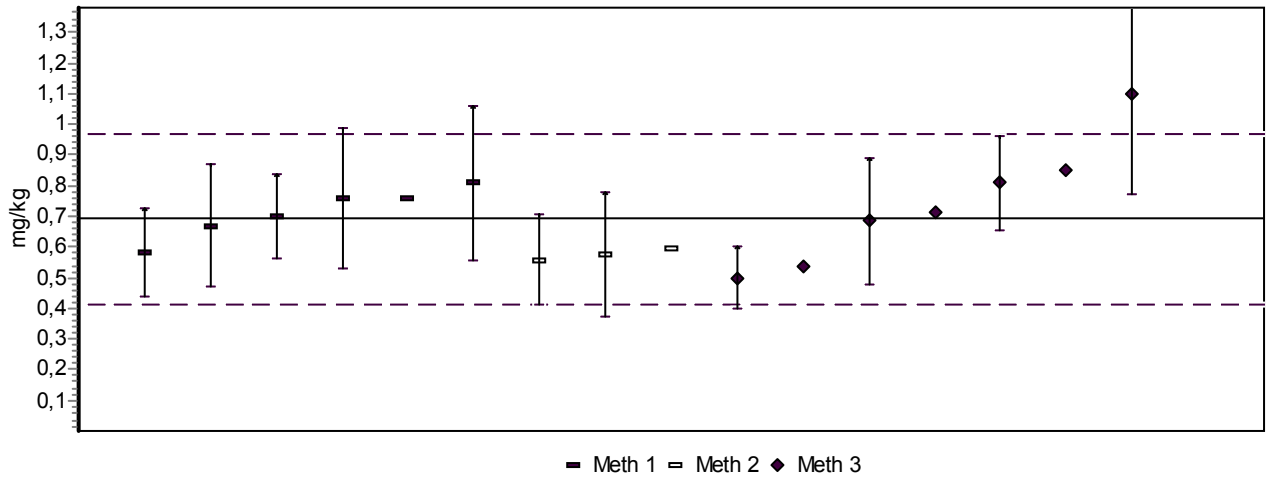
Analyytti *(Analyte)* **Se** Näyte *(Sample)* R1



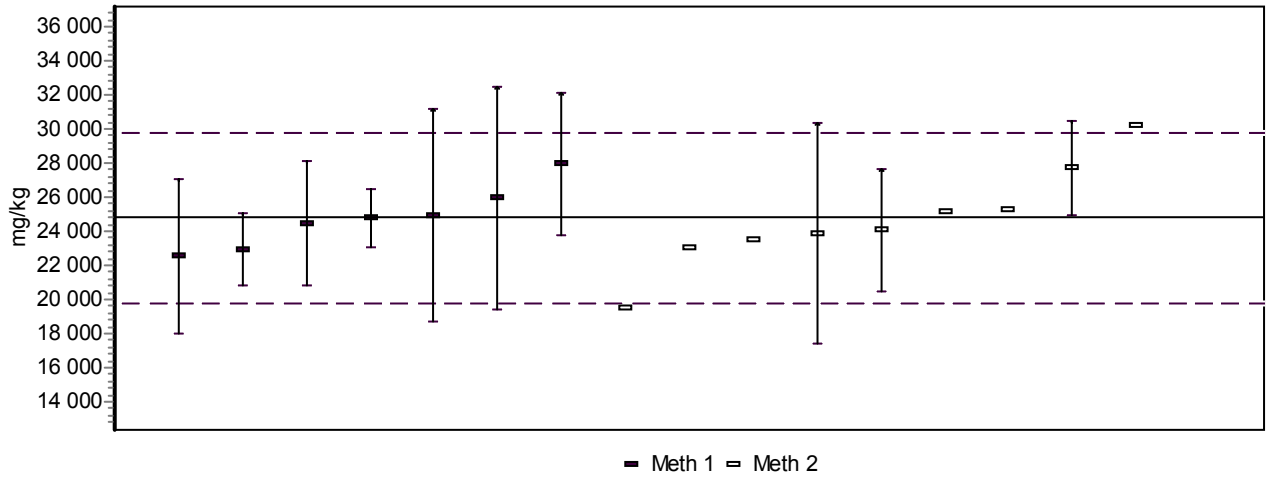
Analyytti *(Analyte)* **Se** Näyte *(Sample)* R21



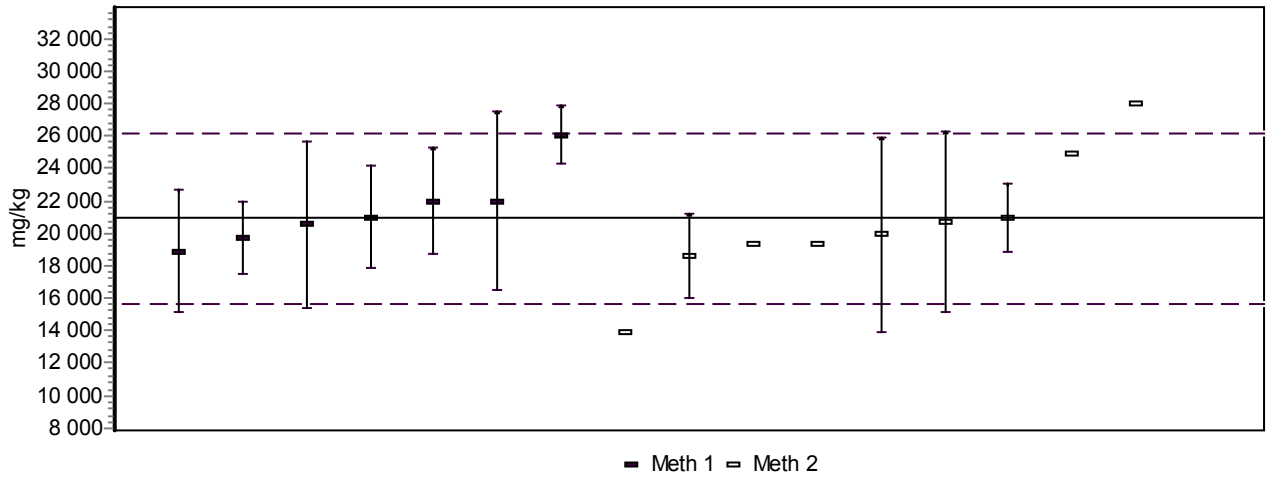
Analyytti *(Analyte)* **Se** Näyte *(Sample)* R22



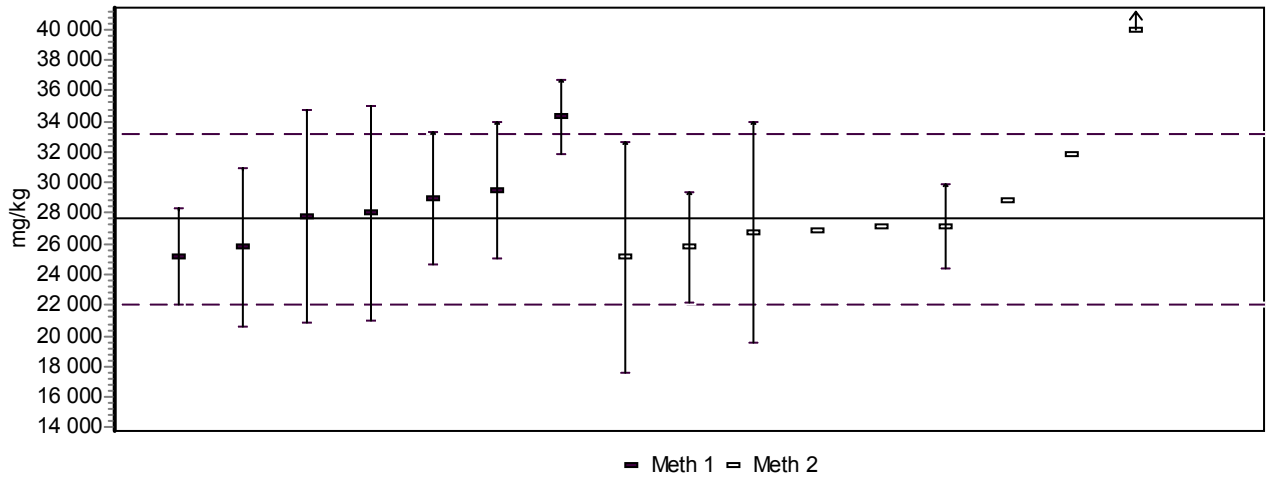
Analyytti *(Analyte)* **SO4** Näyte *(Sample)* R1



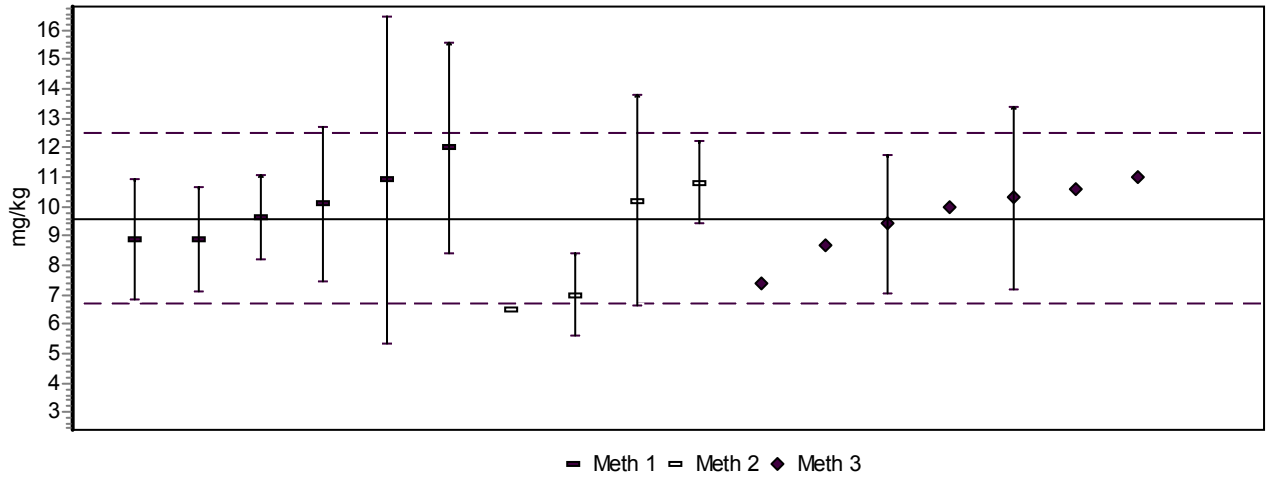
Analyytti *(Analyte)* **SO4** Näyte *(Sample)* R21



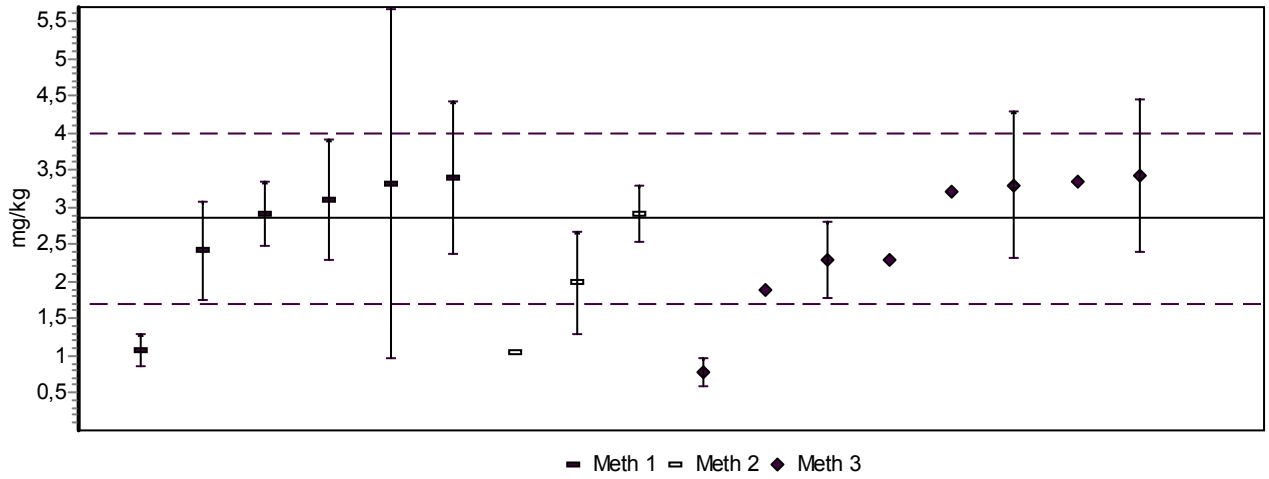
Analyytti *(Analyte)* **SO4** Näyte *(Sample)* R22



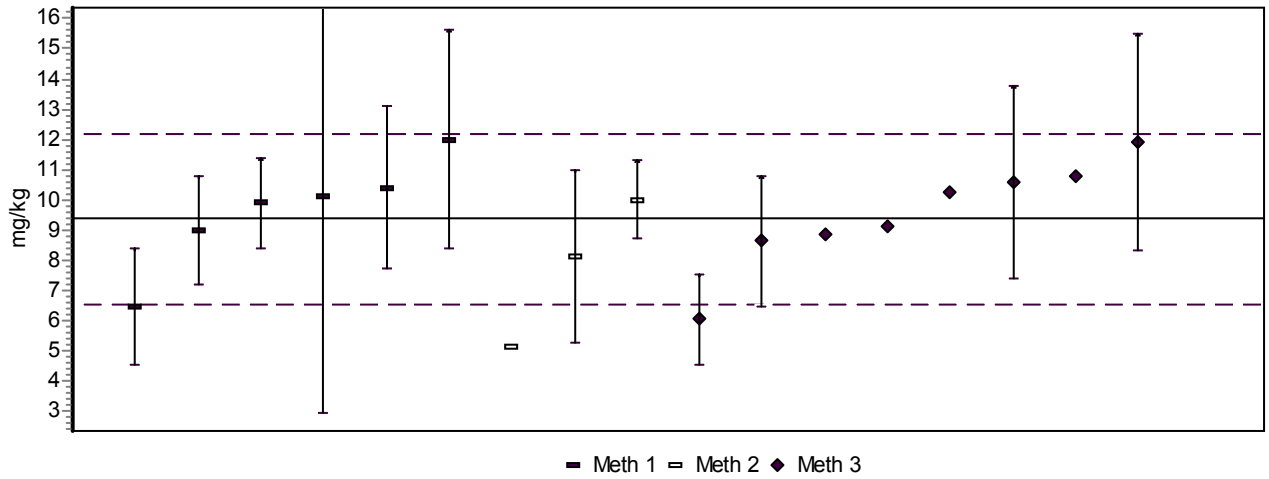
Analyytti *(Analyte)* **Zn** Näyte *(Sample)* R1



Analyytti *(Analyte)* **Zn** Näyte *(Sample)* R21



Analyytti *(Analyte)* **Zn** Näyte *(Sample)* R22



LIITE 9. SUMMARY OF THE z SCORES

APPENDIX 9.

Analyte	Sample\Lab	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	%
As	2R1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	
	R1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	
	R21	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	
	R22	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	
Ba	2R1	S	S	S	S	S	S	.	S	.	S	S	S	U	S	S	S	.	S	S	94
	R1	S	S	S	S	S	S	S	S	.	S	S	S	U	u	S	S	.	S	S	88
	R21	S	S	S	q	S	S	S	S	S	S	S	S	q	q	S	S	.	S	.	82
	R22	S	S	S	S	S	S	Q	S	S	S	S	S	q	u	S	S	.	S	.	82
Cd	2R1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	
	R1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	
	R21	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	
	R22	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	
Cl	R1	.	S	S	U	S	S	S	q	.	S	S	S	S	.	S	S	S	S	S	88
	R21	.	S	S	S	S	U	S	S	S	S	S	S	S	.	S	Q	S	S	.	88
	R22	.	S	S	U	S	S	S	U	S	S	S	S	S	.	S	S	S	S	.	88
conductivity	R1	S	S	S	.	S	S	S	S	.	S	S	S	S	S	S	u	S	S	S	94
	R21	S	S	S	.	u	S	S	S	u	S	S	S	S	.	S	u	S	S	.	81
	R22	S	S	S	.	S	S	S	U	u	S	S	S	S	S	S	u	S	S	.	82
Cr	2R1	S	S	S	S	S	S	.	S	.	S	S	S	q	u	S	S	.	S	S	88
	R1	S	S	S	S	S	S	S	S	.	S	S	S	S	u	S	S	.	S	S	94
	R21	S	S	S	q	S	Q	S	S	S	S	S	S	S	q	S	S	.	S	.	82
	R22	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	Q	.	S	.	94
Cu	R1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	
	R21	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	
	R22	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	
DOC	R1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	
	R21	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	
	R22	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	
F	R1	.	S	S	S	S	S	S	.	.	U	S	S	q	S	S	.	U	S	S	80
	R21	.	S	S	S	S	S	S	.	S	Q	S	S	u	.	S	.	U	q	.	71
	R22	.	S	S	S	S	S	S	.	S	U	S	S	u	S	S	.	U	S	.	80
Mo	2R1	S	S	S	S	S	S	.	S	.	S	S	S	S	S	S	S	.	S	S	100
	R1	S	S	S	S	S	S	S	S	.	S	S	S	S	q	S	S	.	S	S	94
	R21	S	S	S	q	S	Q	S	S	S	S	S	S	S	u	S	S	.	S	.	82
	R22	S	S	S	S	S	S	S	U	S	S	S	S	S	S	S	S	.	S	.	94
Ni	2R1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	
	R1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	
	R21	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	
	R22	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	
Pb	2R1	S	S	S	u	S	S	.	u	.	S	S	S	S	S	S	S	.	S	S	88
	R1	S	S	S	u	S	S	S	S	.	S	S	S	Q	S	S	S	.	S	S	88
	R21	S	S	S	u	S	S	u	q	S	S	S	S	S	u	S	U	.	S	.	71
	R22	S	S	S	u	S	S	q	q	S	S	S	S	S	u	S	u	.	S	.	71
pH	R1	S	S	S	S	S	S	Q	.	S	S	S	S	S	S	S	S	S	S	S	94
	R21	S	q	S	S	S	S	S	Q	S	S	S	S	S	S	S	S	S	S	.	89
	R22	S	S	S	S	S	S	S	Q	S	S	S	S	S	S	q	S	S	S	.	89
Sb	R1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	
	R21	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	
	R22	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	
Se	2R1	S	S	S	S	S	q	.	S	.	S	S	S	q	S	S	S	.	S	S	88
	R1	S	S	S	S	S	S	S	U	.	S	S	S	S	S	S	S	.	S	S	94
	R21	S	S	S	q	S	S	S	S	U	S	S	S	q	S	S	S	.	S	.	82
	R22	S	S	S	S	S	S	S	.	Q	S	S	S	S	S	S	S	.	S	.	94
SO4	R1	.	S	S	S	S	S	q	Q	.	S	S	S	S	S	S	S	.	S	S	88
	R21	.	S	S	q	S	Q	S	S	S	S	S	S	S	S	S	S	.	S	.	88
	R22	.	S	S	S	S	S	S	U	S	S	S	S	S	S	S	Q	.	S	.	88
V	2R1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	
	R1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	
	R21	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	
	R22	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	
Zn	2R1	S	S	S	q	S	S	.	S	.	S	S	S	S	S	S	S	.	S	S	94
	R1	S	S	S	q	S	S	S	S	.	S	S	S	S	S	S	S	.	S	S	94
	R21	S	S	S	u	S	S	S	S	S	S	u	S	u	S	S	S	.	S	.	82
	R22	S	S	S	q	S	S	S	S	S	S	S	S	q	S	S	S	.	q	.	82
%		100	97	100	58	97	87	88	63	82	92	97	100	67	71	97	78	75	95	100	
Accredited		yes	yes								yes		yes	yes		yes	yes		yes	yes	

Analyte	Sample\Lab	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	%

S - satisfactory ($-2 \leq z \leq 2$), Q - questionable ($2 < z < 3$), q - questionable ($-3 < z < -2$),
U - unsatisfactory ($z \geq 3$), u - unsatisfactory ($z \leq -3$)

%* - percentage of satisfactory results

Totally satisfactory, % In all: 87 In accredited: 91 In non-accredited: 83

Documentation page

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Author(s)	Katarina Björklöf, Kaija Korhonen-Ylönen, Marika Kaasalainen, Mirja Leivuori, Sirpa Väntsi, Sari Lanteri and Markku Ilmakunnas	
Title of publication	SYKE Proficiency Test 10/2012 Leaching testing of solid waste sample	
Parts of publication/ other project publications	The publication is available only in the internet www.syke.fi/publications.	
Abstract	Proftest SYKE carried out this proficiency test for leaching testing of contaminated samples using one stage- and two stage batch leaching tests in October 2012. In total 19 laboratories took part in this test. Sample material was ash from recycled fuel and wood in which the main harmful components were Cl^-, Cr, Mo, Pb, Se SO_4^{2-} and Zn. The particle size of the sample was 0.006-0.063 mm and the total organic carbon (TOC) content of the sample was less than 5 g/kg dry weight. The following analyses were tested • metals (As, Ba, Cd, Cr, Cu, Mo, Ni, Pb, Sb, Se, Zn) • Cl-, SO_4^{2-}, F^-, DOC, pH and conductivity The standard methods EN 12457-2 (one stage batch leaching test) and EN 12457-3 (two stage batch leaching test) were used to determinate the leaching properties of studied components from the sample. Some differences in procedures used by the participants in the leaching tests were recorded for shaking the sample and separation of the eluate. It and it is likely that these differences affected the results. The evaluation of the participating laboratories was done using z-scores. The amount of satisfactory results was slightly higher than in the previous proficiency test, 87%, when the total target deviations varied between 10-50 % for metals.	
Keywords	Leaching test, batch leaching test, characterization of waste, waste landfill acceptance criteria, environmental laboratories, proficiency test, interlaboratory comparisons	
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Financier/ commissioner		
Project organization		
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Tekijä(t)	Katarina Björklöf, Kaija Korhonen-Ylönen, Marika Kaasalainen, Mirja Leivuori, Sirpa Väntsi, Sari Lanteri and Markku Ilmakunnas	
Julkaisun nimi	SYKE Proficiency Test 10/2012 Leaching testing of solid waste sample	
Julkaisun osat/ muut saman projektin tuottamat julkaisut	Julkaisu on saatavana vain internetistä. www.syke.fi/julkaisut	
Tiivistelmä	Proftest SYKE järjesti yhteistyössä Kokemäenjoen vesistön vesiensuojeluyhdistys ry:n (KVVY) kanssa pätevyyskokeen lokakuussa 2012, koskien liukoisuustestejä jätteiden kaatopaikkakelpoisuuden arvioimiseksi. Kaikkiaan 19 laboratoriota osallistui pätevyyskokeeseen. Näyte oli kierrätyspolttoaineen ja puun tuhkaa, jonka tärkeimmät haitta-aineet olivat Cl-, Cr, Mo, Pb, Se, SO_4^{2-} ja Zn. Näytteen partikkelijakauma oli 0.006-0.063 mm ja orgaanisen aineen kokonaispitoisuus (TOC) oli alle 5 g/kg kuivapaino kohti. Näytteestä analysoitiin seuraavat parametrit: • metallit (As, Ba, Cd, Cr, Cu, Mo, Ni, Pb, Sb, Se, Zn) • Cl-, SO42-, F-, DOC, pH ja sähkönjohtavuus Määrityksissä käytettiin standardimenetelmiä EN 12457-2 (1-vaiheinen ravistelutesti) ja EN 12457-3 (2-vaiheinen ravistelutesti). Osallistujat käytännöt näytteen ravisteluprosessista ja eluaatin erotusprosessista erosivat eri laboratorioissa ja on todennäköistä että nämä erot vaikuttivat tuloksiin. Osallistuvien laboratorioiden pätevyydet arvioitiin z-arvoja käyttäen. Hyväksyttävien tulosten määrä oli hieman isompi kuin edellisessä pätevyyskokeessa, 87 %, kun kokonaishajonnan tavoitearvot vaihtelivat metalleille 10-50 %.	
Asiasanat	liukoisuustesti, ravistelutesti, jätteen karakterisointi, kaatopaikkakelpoisuus, ympäristölaboratoriot, pätevyyskoe, laboratorioiden välinen vertailukoe	
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Painopaikka ja -aika	Helsinki 2013	
Muut tiedot		

Presentationsblad

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Publikationens titel	SYKE Proficiency Test 10/2012 Leaching testing of solid waste sample	
Publikationens delar/ andra publikationer inom samma projekt	Publikationen finns tillgänglig på internet www.syke.fi/pyblikationer	
Sammandrag	Proftest SYKE ordnade i samarbete med föreningen Kokemäenjoen vesistön vesiensuojeluyhdistys ry (KVVY) med en kompetensprövning i oktober 2012 om laktester som används för vid bedömningen av avfall som ska deponeras på deponi. Sammanlagt 19 laboratorier deltog i kompetensprövningen. De främsta föroreningarna i provet, som bestod av återvunnet bränsle och aska av trä, var Cl^-, Cr, Mo, Pb, Se, SO_4^{2-} och Zn. Partikelstorleken hos provet var 0006-0063 mm och den totala koncentrationen av organiskt kol (TOC) mindre än 5 g per kg torr vikt. Följande parametrar analyserades: • metaller (As, Ba, Cd, Cr, Cu, Mo, Ni, Pb, Sb, Se, Zn) • Cl^-, SO_4^{2-}, F^-, DOC, pH och elektrisk ledningsförmåga I analyserna användes standardmetoderna EN 12457-2 (enstegs skaktest) ja EN 12457-3 (tvåstegs skaktest). Deltagarna använde olika skakmetoder och separering av eluaten och det är troligt att dessa skillnader påverkat resultaten. Laboratorierna bedömdes med hjälp av z-värden. Antalet godkända resultat var 87 % när beräknade värdet för standardavvikelsen för metallerna varierade mellan 10-50%. Detta är något bättre än i den förra kompetensprövningen.	
Nyckelord	laktest, skaktest, karakterisering av avfall, klassificering av avfall för deponi, provningsjämförelse, kompetensprövning, miljölaboratorier	
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